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CONTINUANCE OF ARCTIC RESEARCH.

I.

Routes for Future Arctic Expeditions.

The arguments for the continuance and completion of Polar discovery are the same as those for its renewal. If Her Majesty's Government considered that the encouragement of maritime enterprise, and the exploration of the Polar Region were objects of sufficient importance to justify the despatch of an expedition, to commence that work in 1875, those objects still exist, and the arguments for continuing and completing the work are quite as strong in 1877 as they were in 1875. Indeed, the success of the Expedition of 1875-76, and the experience gained by it, give new strength to those arguments; while the recent discoveries add fresh interest to Arctic research, and give additional scientific importance to its completion.

The discovery of the Palæocrystic Sea, and of 300 miles of its desolate shores, has entirely altered preconceived ideas, and added materially to our knowledge of the Polar area. But this increased knowledge is still very partial, and one of the most interesting objects of future research will be to ascertain the extent of the sea of ancient ice, and the laws which regulate its formation.

The knowledge acquired in 1875-76 fully confirms the accuracy of the rules for Arctic exploration which are based on long experience, and were formulated by Sherard Osborn in 1865. These are—1. Navigate along a coast line, and avoid drifting pack. 2. It is necessary to pass at least one winter at a point beyond any hitherto reached. 3. The ship is merely the base of operations, and sledges are the main instruments for exploration and discovery. The necessity for navigating along a coast line in order to cross the threshold of the unknown region, has received additional confirmation, the valuable results brought home by Captain Nares could not have been secured without wintering in the ice, and the use of sledges for exploring and making discoveries has again been shown to be indispensable. It is, therefore, established that the rules which guided Sherard Osborn in selecting Smith Sound as the best route and in recommending the course to be pursued, must still be considered in full force as guides for the selection of the next best route, and for laying down the principles on which Polar research should be continued.

It is now more certain than ever that the course advocated in Dr. Petermann's letters of 1865, namely, that of attempting to enter the drifting pack north of Spitzbergen in a steamer, in the hope of reaching a very high latitude, must be finally discarded. In the first place, the object is insufficient. Few of the results desired from Arctic exploration would be obtained by a summer cruise of this kind, away from land, even if it was successful. In the second place, all practical navigators who have undertaken scientific investigations in the Spitzbergen seas since 1865, including Nordenskiöld, Koldewey, Payer, and Lamont, have declared that it will not be successful. Lieutenant Payer, entirely coinciding with Professor Nordenskiöld, holds that navigation in the frozen seas remote from the land, is far more dangerous than navigation along a coast line, that it is entirely dependent on accident, exposed to grave catastrophes, and without any definite goal. "All the unsuccessful attempts," he adds, "to penetrate northward from Spitzbergen, were made by expeditions whose course and termination resemble each other as one egg resembles another." Payer repeats what Sherard Osborn had urged since 1865, and what ought now to be accepted as an incontrovertible canon of ice-navigation. In the words of Sir Edward Parry, "experience has clearly shown that the navigation of the Polar seas can never be performed with any degree of certainty, without a continuity of land. It was only by watching the openings between the ice and the shore that our late progress to the westward was effected (in 1819), and had the land continued in the desired direction, there can be no question that we should have continued to advance, however slowly, towards the completion of our enterprise."

We must, therefore, continue to be guided by those canons of Arctic exploration which Sherard Osborn has formulated. But it must be remembered that the Smith Sound route was selected because it was the best by which the threshold of the unknown region could be approached. The work in that direction is now completed, and the next best route cannot, of course, offer the same chances of success and equal advantages. The difficulties will increase as the work approaches completion; but so will the glory of surmounting them.

Four routes now remain for future expeditions. 1. The Jones Sound route, the work of which will be to connect North Lincoln with Aldrich's farthest, and to ascertain the limits of the Palæocrystic Sea in that direction. 2. The East Greenland route, to connect Cape Bismarck with Beaumont's farthest, and so complete the discovery of Greenland. 3. The

route of Franz Josef Land, to explore the northern side of the country discovered by Payer; and 4. The North-east Passage, by which a knowledge of the sea north of Siberia will be completed, and Wrangell Land will be explored.

The two latter routes will probably be found the most difficult, and it is not likely that all the work in either of those directions could be completed by one expedition. Payer and Weyprecht only reached the land discovered by them in 1873, by dint of a long and involuntary drift in the ice. It might be reached by a fortunate and skilful attempt either by the north coast of Spitzbergen, or to the eastward, according to the season. If a winter harbour could be reached on the western shore of Franz Josef Land, discoveries of great interest would be made by sledging parties, and annual communication might be secured by forming depôts on Gilies Land, and other islands probably intervening between North-east Land and Zichy Island. Franz Josef Land seems to be a part of the Spitzbergen group, rising out of the same shallow sea, with deeper water to the north. The exploration of its northern face will be very interesting, and will throw much light on the physical geography of the still unknown portion of the Polar area.

The North-east Passage is surrounded with a halo of romance. It was the first achievement attempted by our earliest Arctic worthies and by the Dutch, and is connected with the names of Willoughby and Chancellor, of Pet and Jackman, of Barents and Linschoten. In later times the labours of Lutke, Nordenskiöld, Gardiner, Wiggins, and the Norwegian walrus hunters have given fresh interest to its approaches; the journeys of Anjou and Wrangell have shown the great geographical interest which attaches to the sea north of Siberia; while the admission of an indication of Wrangell Land on the charts has made its complete exploration a necessary work for the future.

Since 1869 the voyages of Norwegian fishers have overcome the obstacles on the threshold of the North-east Passage, which were insuperable to the early navigators. They have sailed round Novaya Zemlya, and have traversed the Kara Sea. The point is to select the right time in the season for an attempt to cross the Sea of Kara. It has now been established by M. Nordenskiöld and Captain Wiggins that a steamer may always calculate upon being able to reach the mouth of the Yenisei River in August. It remains to be seen whether navigation can be extended round Capes Taimyr and Chelyuskin to the northern shores of the New Siberian Islands. Russian vessels have never been able to get beyond the mouth of the Pyasina. But in 1843, Middendorf saw extensive open water from Cape Taimyr during the summer, and the observations of both Anjou and Wrangell tend to the conclusion that, if Cape Chelyuskin could be rounded, the Polar Sea north of Siberia might be navigated as far as Wrangell Land. The difficulties of crossing the threshold of the unknown region, and reaching new ground by this route, will doubtless be formidable. Nevertheless, important discoveries will reward the future explorer who boldly and successfully advances northwards on this line. He will be in the rear of the ice-laden Polar Sea discovered by the Expedition of Captain Nares, and will thus complete the solution of the questions in physical geography connected with it.

It is, however, the two first routes that I have mentioned which offer the greatest advantages, and most nearly comply with the conditions that have been laid down, namely, those by Jones Sound and by the east coast of Greenland. By both the navigation would be along coast lines, and by both there is a reasonable expectation of being able to establish a base of operations beyond the threshold of the unknown region. Discovered by Baffin in 1616, Jones Sound is said to have been penetrated by Captain Lee in the 'Prince of Wales' whaler in 1848, for a distance of 150 miles. In August 1851, Sherard Osborn went a short distance up Jones Sound in the 'Pioneer,' but was stopped by floes stretching across the strait; and it was also entered by Inglefield, in the 'Phœnix,' in 1853. In the spring of 1853, Sir Edward Belcher explored the north coast of Grinnell Land, which forms the southern side of Belcher Channel leading from Jones Sound. He found open water streaked with sailing ice, and the northern coast or islands trending to N.E. The floes were acted upon by a strong tide, and had evidently been in motion during the previous autumn. Early in June the flights of birds indicated water holes to the north, probably caused by the passage of a strong tidal wave in an east and west direction. The geographical results of an expedition up Jones Sound and Belcher Channel would be the completion of discoveries thence to Aldrich's farthest, including the distribution of land and sea towards Prince Patrick Island, and the character of the region north of the Parry group. The attainment of a suitable base of operations for the sledging journeys is almost certain, so that some measure of success by the Jones Sound route may be relied upon.

But, with equal advantages as regards the chances of success, the East Greenland route offers geographical results of greater importance, namely, the completion of the discovery of that vast mass of glacier-bearing land. The northern known part of East Greenland was discovered by Henry Hudson on June 13th, 1607, who called it "Hold with Hope," and reported that "for aught we could see, it is like to be a good land and worth the seeing." This was in latitude 73° N. Van Keulen, on his chart, has "Land van Edam" in 77° 10′ N., discovered in 1655; and another part of the coast, seen in 1670, marked "Land van Lambert." In June 1822, Scoresby forced his ship through the ice floes which encumber the east coast, and surveyed it from Gale Hamkes Bay in 75° southwards to 69° N., finding little difficulty in sailing along the channel close in shore. In the following year, also, during the month of June, Captain Clavering in the 'Griper,' with Captain Sabine on board, attempted to press through the ice to the east coast of Greenland in 70° 30′ N., but was stopped by an unbroken field sixty miles long. On August 2nd, he again entered the ice in 75° 30′ N., and passed through sailing ice, along the margin of solid fields, to the south-west, at last succeeding in reaching the land. He laid down the coast line from 72° to 76° N., while Captain Sabine took his observations on Pendulum Island.

The German Expedition sailed from Bremen on June 15th, 1869, consisting of the 'Germania,' a little

steamer of 140 tons and with a crew of seventeen men, and the 'Hansa' storeship. The crew of the 'Hansa' demonstrated the existence of a southerly drift along the east coast during the winter, while the 'Germania,' following in Captain Clavering's footsteps, reached a latitude of 75° 30′ N., and wintered at the Pendulum Islands in 74° 30′ N. By the 5th of August the 'Germania' reached open water in shore, but the ice appeared to be firm and without sign of breaking up, to the north of Shannon Island (74° 56′ to 75° 26′ N.). To the south there was much open water. From August 17th to September 13th an attempt was made to go farther north, but without success, the fields being closely packed against the land ice. In 1870 a sledging journey (two sledges and ten men) was undertaken to the northward, between March 8th and April 27th, the first twenty-three days outwards taking the party to 77° N., the most northerly point ever reached on the east coast. Nothing but want of provisions (for they had no system of depôts) prevented a much further extension of the journey to the northward.

The opinion of the German explorers is unfavourable to the possibility of pushing much farther north along the east coast. But all depends on the season, and on vigilance in watching for and taking advantage of a lead. In 1872, Captain David Gray, of Peterhead, in the whaler 'Hope,' saw a wide extent of open water, with a water sky to the northward, on this east coast; and, in 1874, he reported a great and unusual drift of the ice in the Spitzbergen Sea.

On the whole, the East Greenland route ranks next to Smith Sound, as a promising direction to take with a view to exploring an important section of the unknown Polar area. It complies with several of the conditions of success—navigation along a coast line, possibility of finding winter quarters beyond the threshold of the unknown region, and the means of exploring by sledge parties. A depôt ship would be established at or near the Pendulum Islands, while the advanced vessel would only have to reach about the 78th parallel in order to be within the unknown area, and so to make some measure of success certain. Recent experience has taught lessons, and suggested measures which will ensure immunity from scurvy, and with a healthy crew the sledging operations over such ice as is described by the Germans, could be extended four degrees farther north at least, to the 82nd parallel. This would bring them within a short distance of Beaumont's farthest, and the discovery of Greenland would thus be completed—one of the most important geographical achievements that remains to be accomplished by this generation. The east coast is reported to be frequented by musk oxen, and its ice floes by bears and seals; so that the explorers would be able to obtain fresh provisions, while the winter darkness would be much shorter, and the climate less rigorous than that to which the late Expedition was exposed. The magnificent mountains and fiords of this east coast present features of peculiar interest in several branches of science, and the various discoveries made by explorers who will complete the circuit of Greenland will be of great value.

On the whole, then, the East Greenland route is probably the best that can be selected for a new expedition; because it offers greater facilities and better chances of success, and also because by it the important discoveries of the Expedition of 1875-76 will best be followed up and made continuous. But there are at least four routes from which to select, namely, those of Jones Sound, East Greenland, Franz Josef Land, and the North-east Passage. The reasons for continuing the work are as strong as those for commencing it, and geographers ought not to relax their efforts after one success. There should be continuity in their measures, and, through good report and evil report, they should steadily persevere until the exploration of the unknown region round the North Pole is completed.

The navy now has a new generation of able and experienced ice navigators and sledge travellers. The enthusiasm for Arctic work is as keen and fresh as of old; and our confident hope is, that picked crews from the navy of England may soon again be able to repeat the soul-stirring words of Frithiof's Saga:—

"There's the flag on the mast, and it points to the North,
And the North holds the land that we love;
We will steer back to northward, the heavenly course
Of the winds, guiding sure from above!"

THE GREENLAND FÖHN.*

ONE of the chief peculiarities in the climate in the Arctic regions, and especially in that of West Greenland, is the instability of the temperature in the cold part of the year. There is not only a great difference in the mean temperature of each month in different years, but sudden changes from the bitterest cold to a thaw, and *vice versâ*, often happen several times in the course of one month.

Dr. Pfaff has presented the Copenhagen Meteorological Institution with a series of observations made in Jakobshavn over a period of twenty years. From these it appears that the month of February may have a mean temperature of + 16°·3 Fahr., which was the case in 1872, but also one of ÷24°·9 Fahr., which it had in 1863. It will thus be seen that, in a period of eleven years, the mean temperature of the month of February differed 41° This variableness is nearly incomprehensible to us who live in the western part of Europe, for it is about as great a difference as there was in Copenhagen, in about the same period, between the coldest winter month (February 1870, 23°·5 Fahr.) and the warmest summer month (August 1868, 66°·2 Fahr.) The Jakobshavn series of observations also presents the most wonderful instances of changes of temperature from day to day. During the month of February 1866, the thermometer rose three times more than 45° Fahr. during twenty-four hours. On the 3rd February, 1871, in the morning it stood at −13° Fahr., in the evening at 6°·8 Fahr., and the next morning at 33°·8 Fahr. On the 31st January, 1873, at 2 P.M., the temperature was ÷5°·8 Fahr.; but, before 11 P.M., it was 33°·8 Fahr.

These peculiar and sudden changes from cold to heat are—as far as the observations before us allow us to conclude—especially marked at Jakobshavn; but they also take place all along the western coast of Greenland, from Cape Farewell to Upernivik, and they generally happen at about the same time on the greater part of this coast. They have, of course (as

* This article was read as a lecture before the Danish Geographical Society. See our number for June, p. 166.

the reader may suppose), given rise to a great deal of speculation, because they happen nearly *when the wind goes towards S.E. or E.* It seems very curious, indeed, that the temperature should become warmer contemporaneously with a direction of the wind which blows straight from the highlands of the interior of Greenland, which are covered with eternal snow and ice. It is not surprising to find that old authors have attempted to explain this peculiar phenomenon by surmising the existence of active volcanoes, or even that there was a comparatively mild climate in the interior of Greenland. This surmise cannot, for meteorological reasons, be maintained; for an Arctic continent must necessarily, on account of the radiation of heat in the winter time, be colder in the interior than near the coast, where the sea has a mild influence on the climate. In the excellent description of the climate in the *Northern Inspectorate of West Greenland*, published by Dr. Rink in 1857, another explanation of the peculiar warmth of the S.E. wind was hinted at. An important step was then taken towards the correct understanding of the phenomenon, which will be fully gone into in this paper.

A glance at the map will show that Greenland is surrounded by regions which, especially in the winter, have extremely different temperatures. Towards the W. and S.W., in Labrador, in the Hudson Bay territory, and in the Arctic islands north of America, so strong a cooling takes place at this season that the mean temperature of January is as low as ÷4° to ÷31° Fahr. Towards the E. and S.E. the Gulf Stream preserves, even in mid-winter, a temperature in the Atlantic of 32° to 41° Fahr., so that the air above it may generally be supposed not to be much colder than freezing-point.

As Greenland lies between such different climates, its own must necessarily at all times be dependent on the direction of the winds. All winds from the S., through W. up to N.E., must bring comparatively cold weather; but the E. and S.E. wind, heat, and especially the S.E. wind, which comes from the warmest part of the surrounding Atlantic, and also has the shortest distance to pass over the ice deserts of the interior to reach the western coast. The character of the winter in Greenland will, therefore, decidedly depend on whether the S. and S.E. winds have been prevailing or not during the season.

A good instance may be taken from the winter of 1874-75. Though the western coast of South Greenland was clogged with drift ice as far out as the eye, from considerable heights, could discover, whereas the coast at this season is usually nearly quite clear of ice, the winter was, nevertheless, comparatively very mild, because the S. and S.E. winds were very much more prevalent than they usually are.

Although there can be no doubt but that the S.E. wind, on account of the region from whence it comes, must appear as a warm wind in West Greenland, yet it must be admitted that this is no sufficient explanation of the great rise in the thermometer which is often observed when this wind blows, especially when it appears in a storm.

When in Jakobshavn, shortly before Christmas, the thermometer reads 48° Fahr., whereas the normal temperature would be 10° Fahr., then it is not possible that this great heat should be due only to the Atlantic, which lies nearest S.E. off Greenland, for it is quite improbable that the air should have so high a temperature there at this season; and even if you would suppose that it crosses Greenland during a common gale so quickly as in eight to ten hours, yet it must on its journey be more or less cooled by contact with the great bodies of ice. We may even in South Greenland, in December, observe a temperature more than 57° Fahr. during S.E. storms, and at the same time we shall not meet with this temperature on the Atlantic very much nearer than the Azores, and it is not probable that the air should have reached Greenland from thence with unchanged temperature.

There are also other qualities, besides its high temperature, which are especially characteristic of the S.E. wind in Greenland. It always comes very dry; the snow disappears in the low land, but no running streams appear. The storm first commences in the tops of the mountains from which you may observe the snow being whirled high up into the air, only gradually the wind works down into the hollows by the fiords (creeks); sometimes the S.E. wind commences with light squalls with snow or rain, but the sky then generally soon clears and downfall rarely happens, as long as this wind blows.

These circumstances lead us to consider facts that are well known in other parts of the world, and which might help in discovering the circumstances that are active in producing the high temperature in the S.E. wind in West Greenland.

It sometimes happens that *on the northern slope of the Alps* a gale-like southerly wind commences very suddenly, which rushes down with irresistible force from the snow-covered peaks into the narrow valleys that lead towards the north and agitate the great Alp-lakes terribly. This wind, which is called *Föhn* is, although it comes from the snowy region, unusually hot and very dry. Professor Dufour has shown, that during a *Föhn*, which raged on the 24th and 25th September, 1866, the thermometer stood 11-16 degrees Fahr. higher than it normally could be expected to do, and that the temperature was curiously enough higher in the city of Zug, although it lies 440 feet above the surface of the sea, than it was at the same time north and *even south* of the Alps. That the *Föhn* wind is unusually warm and dry is also proved by the circumstance that the limit of the snow is in the valleys always found to have receded considerably when the gale ceases; from this reason it is also called "the great snow-melter." Whereas the S. wind blows on the northern side of the Alps as the dry and hot *Föhn*, it appears on the southern slope as a moist *Sirocco*, which is often accompanied by an enormous downfall of snow. Some years ago Dr. Hann, in Vienna, most satisfactorily solved this mystery.

It is well known that the pressure of the air lessens upwards in the atmosphere; any body of air which is from some reason forced to rise from the surface of the earth up to a certain height, will for this reason gradually more and more be exposed to a less pressure and will in consequence expand; as, however, every expansion is a process that consumes heat, the air will consequently be cooled while it rises. So long as the cooling allows the air to contain its vapour dissolved, it will, according to calculations, proved by observations, cool 1° Fahr. every 180 feet it rises. When the dewing point is exceeded, so that the vapours begin to separate into clouds, rain or snow, then will—

on account of the transition of the moisture from an airy to a fluid or firm state, whereby the latent heat is released—the cooling process at once proceed very much slower, and it may, for the distances we deal with, be put at ½° Fahr. for every 180 feet. When, on the contrary, a body of air sinks towards the surface of the earth, it will gradually come under a greater pressure, *i.e.*, it will be compressed, and consequently be heated. Its temperature will then more and more differ from the dewing point, and the vapour will with greater and greater ease remain dissolved in airy state. The rise in temperature will consequently be during the fall 1° Fahr. per 180 feet. If we, taking this into consideration, consider what happens when a S. wind is forced to rise up the Alps, we shall find that such an air current will arrive at the southern foot of the mountains hot and nearly saturated with moisture, for it comes from the Mediterranean. During its rise it will rather quickly be cooled to its dewing point, and will, from this moment, only lose during a heavy downpour of rain, and, afterwards, of snow, ½° Fahr. every 180 feet it rises. When it goes beyond the mountain ridge the air current pours with great force through the narrow Alp passes and valleys down the northern slopes, and is heated 1° Fahr. every 100 feet, and becomes more and more comparatively dry, for it cannot contain much more moisture than corresponds with perfect saturation at the low temperature it had when passing beyond the ridge.

If we leave out of consideration the amount of cooling that takes place on its way through irradiation and contact with the great mountains, we shall, by a simple calculation, get at the following result:—*The temperature of the S. wind must be at the northern foot of the Alps about as many ½ degrees Fahr. greater than at the southern foot as the mountains' height in feet divided by* 180, for it lost ½° Fahr. every 180 feet it rose, and gained 1° Fahr. every 180 feet it fell.

In this way the curious qualities of the *Föhn*, and especially the fall of snow on the south side of the Alps, which is simultaneous with unusual heat and dryness on the north side, may be explained without difficulty, and it also proves that similar phenomena will appear in greater or lesser degree wherever a moist and comparatively hot current of air is forced to rise over an obstacle, which it finds on its way. The best proof of it may be found at the Alps, for, under favourable circumstances, a N. wind can produce similar results, only *vice versâ;* for it appears in the form of a snowstorm on the north side, as a dry and hot *Föhn* on the south side.

Föhn is now the common name *for those peculiar climatic circumstances observed in the most different parts of the earth on the leeward side of chains of mountains or highlands.*

Let us now return from the Alps to Greenland, and we shall easily be convinced that the characteristic qualities of the *Föhn* are just the same as those described as belonging to the hot S.E. wind on the west coast of Greenland, and, in so far as this wind comes from the Atlantic, S.E. off Greenland, it will be no difficult matter to prove that the conditions for the appearance of a *Föhn* wind are fully there.

According to the enquiries and measurements lately made in Greenland of the height of the coast-land, it cannot be doubted that the mountains in the interior at least rise to a height of 6000 to 7000 feet. By passing this ridge a current of air would therefore, if it comes from the sea, and consequently is saturated with moisture, theoretically gain $\frac{6000}{180} = 36$ times ½° Fahr, or 18° in heat. If, therefore, the wind on the S.E. coast of Greenland only had a temperature of about 41° Fahr., it could afford to lose considerably by cooling on its journey of 400 miles over ice deserts to Jakobshavn, and even after such a loss appear with a temperature such as is often observed in the winter months of 42°, 46°, or 50° Fahr.

It may thus be said that there is a very great probability that the S.E. wind in West Greenland owes its peculiarly high temperature to two circumstances, viz., that it brings air away from the comparatively warm Atlantic, and also that this air must rise over a great height to be able to reach the west land. Of this, however, there has not previously been any proof. Neither has it been satisfactorily explained why this wind produces a very much varying temperature, although it apparently always comes from the same direction; at times it will bring the thermometer up to 50° Fahr. in the coldest part of the winter; at others it will only diminish the frost, and sometimes it has scarcely any effect.

The difficulties in tracing the *Föhns* in Greenland are very much greater than elsewhere. Although we have a sufficient number of observations to prove its appearance on the west coast, yet we have none to enable us to follow it backwards to its sources, for, as we know, the interior and south-east coast of Greenland is not inhabited by Europeans, nor are any ships about in the neighbouring parts of the Atlantic in the winter time of their own accord. In a solitary instance there are certain observations from the east coast of Greenland made by the shipwrecked crew of the 'Hansa,' belonging to the second German Polar expedition. After the ship was lost the crew drifted on an ice floe during the winter of 1869-70 and the following spring, from about 70° N. lat. southwards along the whole east coast of Greenland as far as Cape Farewell. There are, however, several unlucky circumstances that made the observations of this wonderful voyage rather useless for our purposes. *Firstly*, the barometer, which is, without comparison, the most important instrument, was lost on the wreck of the ship; *then*, the floe only reached that part of the east coast of South Greenland where it would be possible to meet with the S.E. wind before its rise, very late in spring; and, *lastly*, this spring was unusually poor in *Föhn* phenomena in West Greenland itself. The travellers found the N. and N.E. winds predominant, and especially did the most of the gales come from this direction.

Although we did not succeed in tracing the S.E. wind in the Atlantic from this source, meteorology however affords another and safe means of determining the direction of air currents in a place where there are no local observations. We have, namely, the Buys-Ballot's law, which, in its simplest form, asserts that the wind always blows in that direction, that it has a higher air pressure on its right than on its left side, and that the more unequal the pressures are, the greater is the velocity of the air. It would, therefore, be sufficient for the purpose of proving a south-easterly air current in and over Greenland *to find that the barometer stood, at a given period, higher in Iceland than*

in the Davis Straits. The greater difference in the barometer readings would prove a stronger and more decided S.E. wind blowing between the two places. We will now apply this law in a given instance.

Towards the end of November and the beginning of the month of December 1875, there was a period of *Föhn* in West Greenland, which must, on account of its long duration, the high temperature, and the violent gales, be considered as very unusual. In perusing the observations of twenty years at Jakobshavn the author has not succeeded in finding any instance of a winter *Föhn*, that even approximately can be compared to the one observed in 1875.

In the northernmost meteorological station in West Greenland, *Upernivik*, 72° 45′ N. lat., the *Föhn* commenced on the 24th November with an easterly gale. The thermometer stood in the morning at 14° Fahr., in the evening it rose to freezing point, and the next day, towards evening, it rose to more than 51° Fahr. If we take into consideration that the normal temperature of this season is about 5° Fahr., we find a heat excess of 46°. The weather kept, with only a short interruption of light frost, from the 5th to the 8th of December, extraordinarily mild up to the 12th of December, or nearly eighteen days. The wind was mostly easterly, and especially in November very stormy.

In *Jacobshavn*, 69° N. lat., the *Föhn* commenced with a violent south-easterly gale in the night of the 23-24th November. The thermometer stood, on the 24th, in the evening, at 33° Fahr., and next morning at 46½° Fahr. As the normal temperature is about 16° Fahr., the heat excess was 30½°. The *Föhn* heat remained, with a shorter interruption of light frost on the 6th and 7th December than at Upernivik, up to the 12th December. Yet, the day before it ceased, the thermometer showed 47° Fahr. The wind was nearly uninterrupted S.E. and very stormy; on the 2nd December it was like a hurricane, with the thermometer at 50° Fahr. the whole day.

In *Godthaab*, 64° N. lat., the commencement of the *Föhn* was not so clearly marked as in the stations more to the north. On the 23rd November, the thermometer already rose, during an easterly gale, over freezing point, and next morning to 38° Fahr., but then it fell under freezing point until the *Föhn* proper began, on the 26th November, in the evening, and lasted, without interruption, until the 11th December, in the evening. During the last days of November the heat rose to 53° Fahr. The wind was, as it usually is on this station, more changeable than further north, but varied mostly between N.E. and S.E., seldom blowing a gale.

On the station, *Kornok*, far into the Godthaab fiord, the thermometer also rose, by strong E. wind, first on the 23rd November, over freezing point towards evening, but the heat remained there, although the land ice is in greater proximity, more constant, and at a higher figure than at Godthaab, up to the 12th December. The wind was predominantly S.E., and very stormy, until the 3rd December; later on, it blew mostly from E.N.E., and with less force. In the last days of November, and the first days of December, the thermometer stood at 52° to 54° Fahr.

At the entrance to the Godthaab fiord, about eight miles west of Godthaab, on the station *Kungek*, the *Föhn* likewise commenced on the evening of the 23rd November, with a strong easterly wind, and kept up pretty well until the 12th December; the temperature, however, was somewhat lower and less constant than at Godthaab, and the wind was very variable both in direction and force. On the last day of November and the first day in December, it blew a strong north-easterly gale, with the thermometer at 46° Fahr.

Finally, on the station most to the south, *Ivigtut*, 61° N. lat., which is known by its cryolite quarries, the *Föhn* commenced already on the 19th November, for the thermometer rose during a south-easterly gale to 45½° Fahr. On the 24th and 25th November, a short interruption with light frost set in, but after that time the temperature steadily kept higher than freezing point up to the 12th December. Several times the temperature rose from 50°-54° Fahr., and it even reached a maximum of 57½° Fahr. on the 8th December. The wind, all through, S.E., and very stormy; several times it blew nearly a hurricane.

We have thus found a very remarkable *period of 18-20 days' duration*, in which the great cold of the winter in West Greenland is broken by mild weather by easterly and south-easterly gales. The thermometer rose in the southernmost part of Greenland above 57° Fahr., and stood, even as far north, as 73° N. lat., 51° Fahr. Whereas the mean temperature of West Greenland at this season normally would range between 26½° Fahr. towards the south, and 5° Fahr. in the north, we find that the days between the 23rd November up to 11th December 1875 give a mean temperature of 40° Fahr. in the south, and 32° Fahr. in the north.* There was thus a heat surplus of about 13½° in the south, and so much as 27° in the north.

We may observe that the *Föhn* prevailed about the same time along the whole of the inhabited part of the west coast, but that it commenced somewhat earlier in South Greenland than in North Greenland. The wind varied in the different localities between N.E. and S.E.; but these variations had, nevertheless, no great influence in changing its peculiar qualities, and therefore they may, probably, be due to local circumstances, such as the directions of the fiord-valleys. The force of the wind was very great, and, often, even violent. We may also observe, on account of the good position of the meteorological stations on the Godthaab fiord, that the *Föhn* appears hottest immediately after its descent from the inland ice, and has already lost no little part of its heat before it reaches the outer islands. How far into the Davis Straits and Baffins Bay the *Föhn* does reach cannot be decided; but a lucky chance showed that an English vessel lay frozen on the other side of the Straits near *Harrisons Point*, 66° N. lat., that is to say, about the same latitude as Godthaab. According to the meteorological journal of this vessel,† the mean temperature was, from the 23rd November to the 11th December, 6° Fahr., that is to say, 31° colder than at Godthaab. The wind was predominantly westerly, and it only twice veered round to the east, which caused a considerable rise in the temperature, to 24° Fahr. and 28° Fahr.

N. HOFFMEYER, Capt.
Director of the Meteorol. Inst., Copenhagen.

* The mean temperature was in Ivigtut 40°·3 Fahr., in Godthaab 36°·7 Fahr. (Kangek 34°, Kornok 38°·8 Fahr.), in Jakobshavn 38°·8 Fahr., and in Upernivik 35°·5 Fahr.

† This information is due to the kindness of Mr. Scott, Director of the London Meteorological Office.

NOTE ON THE DRAINAGE OF THE UPPER OXUS BASIN.

AMONG the inquiries which engage the attention of an engineer, the investigation of the flood volumes of rivers of a district is an important one. For determining the proper waterway of bridges, for drawing up projects for the water supply or drainage of towns, and for irrigating the neighbouring land—all purposes which involve a heavy expenditure of money—a lengthy series of detailed observations of various natures is indispensable. But preliminary estimates may usually be compiled in combining and comparing the information derived from local traditions or from noting actual flood marks, or from a few measurements of one river, with the results acquired from a more certain knowledge of other rivers. The process of finding a flood discharge may be executed by the aid of an empirical formula, wherein the area of the basin, the length of the river's course and a constant, adapted to the local physical conditions, enter as functions. On the other hand, having a more or less accurate knowledge of the flood volume of a river, the value that might be found for the constant in the above formula would broadly indicate the different physical conditions which attach to the drainage basin under examination.

It is in this way that physical geographers, when dealing with a little known or unexplored river, may find the above process of comparison useful. The results afforded by such a formula, though not exact, may sometimes enable them to indicate special physical conditions of a drainage basin, which would otherwise escape attention, from a difficulty or an impossibility of observing it properly. Investigations of this nature would justly be relegated to obscurity after an accurate knowledge of the locality in question had been attained. But, meanwhile, geographical interests would be served in utilising such scanty information as might be available; and in the present paper I shall therefore endeavour to compare the drainage basin of the Amû-darya with others of which we possess fuller and more accurate knowledge.

My memoir in *Journal R.G.S.* for 1875 stated the maximum discharge of the Amû-darya to have been about 144,000 cubic feet per second in the year 1874* This quantity was the volume that passed Toyon-boyin, a point on the river above where the irrigation canals commence to be diverted (chiefly) for the fertilization of the Khanate of Khiva. For a distance of about 450 miles up the Amû-darya from Toyon-boyin the river receives no affluents, and the figures above given should, therefore, represent the flood discharge at a point situated near where the stream is crossed by the 67th parallel of E. longitude. The area of the drainage basin, above the second locality specified, is about 85,000 square miles, and the question presented for consideration is, whether this volume of 144,000 cubic feet per second fairly represents the maximum drainage that might be expected to flow, in any ordinary year, from a district possessed of the physical character of the country traversed by the Upper Oxus?

An ordinary maximum flood discharge of the Amû-darya amounts (as it appears) to about 1¾ cubic feet per second per square mile of the country drained; and if this be compared with the flow from European Alpine districts (many of whose physical characteristics cannot be very dissimilar to those of the great central Asiatic highlands), we shall immediately be struck with a remarkable discrepancy. In the Arve (for example) a stream that drains 772 square miles of the most precipitous and snow-bound district of Europe, an ordinary maximum flood would amount to 10 or 11 cubic feet per second per square mile. The Rhone, whose valley above the Lake of Geneva has an area of 2307 square miles, discharges in an ordinary flood about 11¼ cubic feet per second per square mile at Porte du Sex. The basin of the Upper Ticino, embracing an area of 2518 square miles, has an ordinary maximum flood discharge of 11¾ cubic feet per second for every square mile of country drained, down to Sesto Calende. In the last case it might have been supposed that Lake Maggiore (which covers rather more than 80 square miles) would have been found more efficient in moderating the drainage flowing into it; for on this head it is to be noted that the flood volume of 11¼ cubic feet per second per square mile, which enters the Lake of Geneva, is reduced to a maximum discharge of 5 cubic feet per second per square mile, flowing out of the lake. Lake Leman is, however, nearly thrice the size of Maggiore. The greater drainage from the basin of the Upper Ticino is doubtless due to the rainfall, amounting to a yearly average of 66 inches, as compared with one of 34 inches that takes place in the Upper Rhone Valley, and this circumstance suggests whether the discrepancy that has been indicated in the volume of drainage flowing from the Upper Oxus basin can in this way be accounted for.

Even, however, if we allowed as much as 5 cubic feet per second per square mile out of the volumes draining from the Arve, Upper Rhone, and Upper Ticino basins as due to rainfall, we should still find the discharges of these three Alpine rivers of Europe to be nearly four times larger than the quantity of water carried down from the plateau of Central Asia by the Oxus. Nor is it, indeed, certain that the latter river may not be swelled by precipitation—in addition to melted snow from Pamir—from the slopes of the Hindû Khûsh, &c. Though the Upper Oxus Valley is on the verge of the great rainless Asiatic track, our knowledge of the climate is as yet very limited. Wood, during his journey to and from Lake Victoria, mentions having experienced heavy rain in Badakhshân in December; while he also describes precipitation in considerable quantities to have taken place on eight or ten days in the following March. We can, therefore, be by no means sure that rain does not fall in the Valley of the Upper Oxus during the summer, and that the drainage of 1¾ cubic feet per second per square mile, is entirely due to melted snow and ice. But, even should it be assumed that no precipitation occurs during the epoch of the Oxus floods, we know, on the other hand, that local physical conditions exist, which should intensify the action of those floods; for a great part of the slopes of the drainage basin must be extremely steep, while no forests exist which might regulate or check the descent of melted snow-water flowing down those slopes. Neither along the upper courses of the

* Burnes calculated the Oxus flood in 1837 to have been about 150,000 cubic feet per second.

Amû-darya do any lakes occur whose presence might act as moderators of the flood stream that rushes down towards Lake Aral. All such considerations tend to show that, judging from the Alpine rivers of Europe, the ordinary flood discharge of the Amû-darya should apparently be nearly four times greater than the quantity that has been measured.

On the other hand it must be remembered that the Alpine basins which have been referred to possess an area of about 1-30th only of that of the Upper Oxus, and that the greater length of the course of this river must therefore in itself act as a moderator of floods. Still, the whole portion of the Amû under consideration receives an enormous number of affluents from the high snow-bound mountains which border Pamir, Afghânistân, and the southern limit of the Zarafshân Valley. Even in December, according to the notes registered by Wood, one of the affluents alone (the Khânabâd River) must have been carrying 5000 cubic feet per second. At Jânkila, on the Oxus, above the confluence of the Kokcha, the river must have gauged in March — according to the same authority—something more than 20,000 cubic feet per second; while below the point named it had still to receive five large tributaries before carrying its full stream.

If, now, we turn to the Danube at Pesth, where the drainage basin of this river is little smaller than that part of the Oxus basin we are speaking of, the ordinary flood discharge per second per square mile will be found to be 6 cubic feet; and deducting one-half of this for rainfall, and attributing the other half to melted snow-water from the northern slopes of the Alps, we shall still find the Oxus flood discharge to be about a half of what one might expect it to be. Bearing in mind, therefore, that the figures given for the Amû-darya may be accepted as an approximation to the truth, some explanation of the apparent smallness of this flood discharge becomes necessary.

Although we know the character of the soil of the Upper Oxus Valleys to be decidedly cretaceous, it would, perhaps, be going too far to assign to such conditions any paramount moderating effect on the floods of the river. However, as a fact, such is actually the case in the Thames basin, where the waterway of bridges crossing streams which drain areas of chalk, plainly show the relief that is afforded to flood waters by the geological structure of the locality. But, whether such a cause may operate or not in the case of the Amû-darya, I am inclined to suggest another, though somewhat similar, explanation of the difficulty; and one, moreover, which, from the ancient history of the Oxus, may at the same time be regarded as being almost special to this river. If the theory I have elsewhere broached be a just one, and if the whole of the great sandy desert that stretches from the Caspian eastwards was formerly cultivated by the aid of irrigation canals, derived from the ancient Oxus, which flowed westwards from some point above Charjui to Balkhân Bay, it is highly probable that a considerable proportion of the flood of the Amû-darya must now find its way into the old course, and into obliterated irrigation canals, and be thus lost to the stream, that passes to Toyon-boyin at the present time. Although this desert is as yet very little known, still many routes lead across it in different directions, and wells of good water exist along those routes. On the surface of this desert, which has been crossed by Taylor Thompson, by Abbott, and by Richmond Shakespear, there is abundance of shrub, jungle, and other vegetation; while sweet water is found under the sands which now hide the old Oguz bed of the Oxus.* Thousands of Turkomans must nomadise in this desert, with large herds of camels, and must be able to procure water for their sustenance in spring, at least when the flood season of the Amû-darya commences.

To show that this explanation of the small flood volume passing Toyon-boyin is not entirely unworthy of consideration, I shall quote a passage from a paper by Colonel P. P. L. O'Connell, Royal Engineers, which is printed in *Proceedings of the Institution of Civil Engineers*. The passage is as follows:—

"The beds of most rivers of Southern India are dry for many months in the year. Some of these beds appear to be connected with extensive strata of sand near the sea, so that the first floods of the wet season are very much moderated, and in some instances lost before reaching the sea. The Pennair, a river entering the sea near the town of Cuddalore, has a total length of 250 miles. It drains about 6000 square miles of country. The water was 3 feet deep in this river at Mannaloorpett on 16th May, and again 6 feet deep on 4th June 1855 at Riandavaram, while at Cuddalore there was no sign of a fresh, the whole having been absorbed in the 60 miles of river bed lying between the two last places named."

Thus, there is scarcely any doubt that, like many Indian rivers, but in an enormously greater degree, the Amû-darya contributes some large portion of its flood waters to the sand drifts, which now fill up the ancient course of the Oxus and the buried irrigation canals, which cross the wide expanse of desert that stretches from the left bank of the Amû-darya down to the eastern shores of the Caspian. In this way, the apparent smallness of the present flood volume of the river is reasonably accounted for; until such a time, at least, as it shall have been measured at the locality where the Amû ceases to receive any water from tributaries, or until fairly reliable observations of the rainfall characterising the Upper Oxus Valleys shall have been recorded.

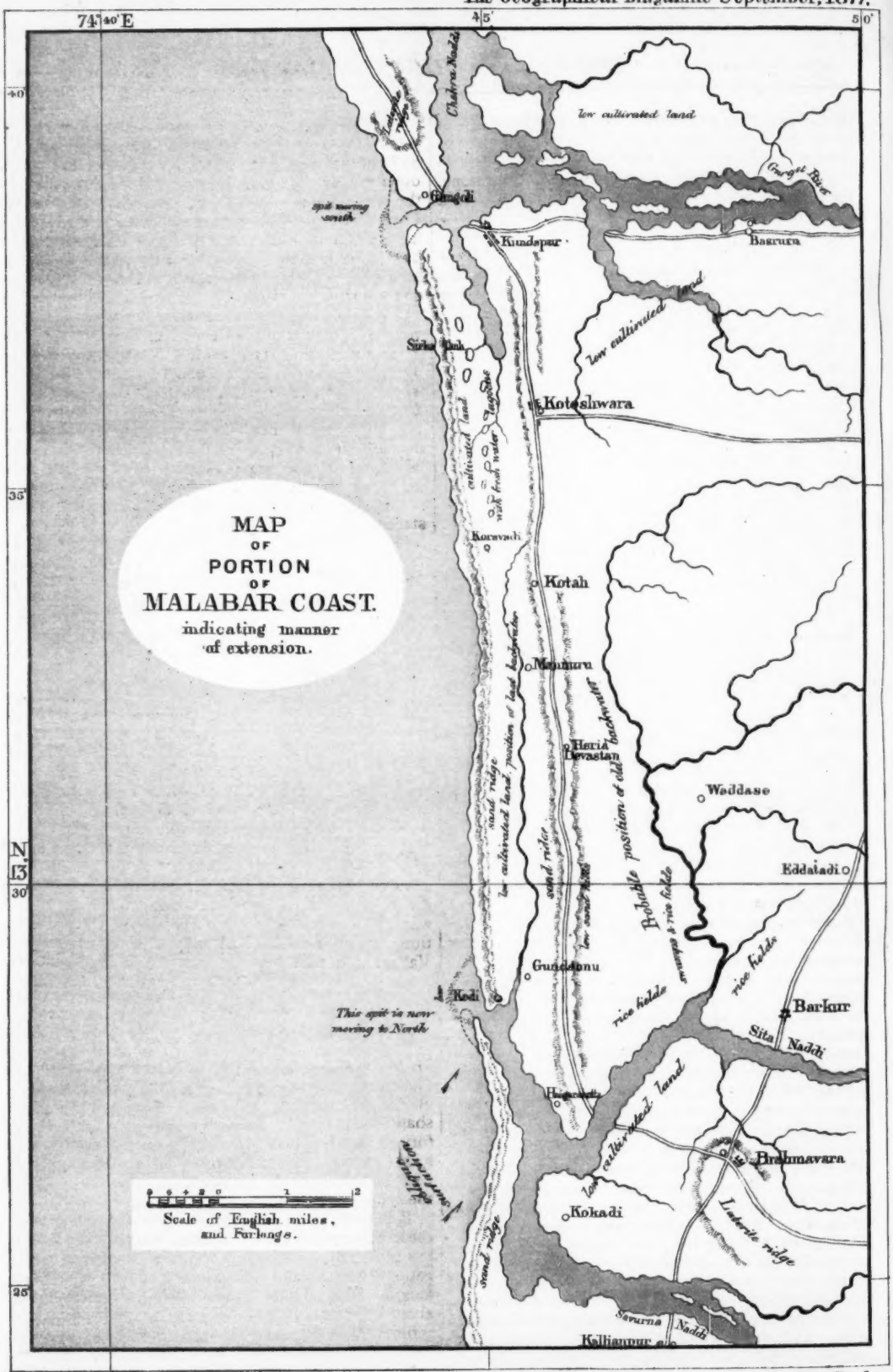
HERBERT WOOD.

EXTENSION OF THE MALABAR COAST.

IF any large map of India, such as Mackenzie and Conner's, is consulted, it will be seen that the estuaries of the rivers of the Malabar Coast are of a peculiar shape. Before the rivers mingle with the ocean, they form broad and extended sheets of water, separated from the sea by narrow strips of land, and comparatively small openings through these strips give exit to the waters.

Popularly known by the name of "backwaters," these inlets form a chain, which, by the addition of a few more links, would secure inland water communication from Canara to Travancore, some 350 miles in length. The sections of the canal required to bring about this desirable end have been "under consideration" for many, many years. How desirable, we—

* *Vide Proceedings R.G.S.*, Volume xx., "Napier's Journey on the Turkoman Frontier of Persia."



T. Pettitt & Co. London.

who sojourn in a land cut off for months from the rest of the world by swollen rivers and a boisterous sea, whose solitudes are seldom invaded by vessels from June to September—know best.

Many of the backwaters form excellent harbours, such as those of Cochin and Mangalore; but they are one and all marred by dangerous bars at their entrances. In nearly every case, too, the mouths are of a shifting character, generally—so far as my observations go—moving from south to north.

I propose, in this paper, to show briefly the forces that are at work in the formation of backwaters; and that the final result of their action is the gradual extension of the west coast of India. I must premise that, though I have travelled occasionally on the backwaters as far south as Cochin, I am not intimately acquainted with other than those of South Canara, which I have had under observation frequently since 1870. Illustrations are, therefore, taken from this district.

Glance again at the map, and mark the Western Ghats, with the low country, drained by innumerable streams, betwixt their heights and the Arabian Sea. The Ghats rise two to three thousand feet, with peaks of six, seven, and eight thousand feet, whilst the plains cannot exceed an average of more than a very few hundred feet. Against the hill-barrier falls the full force of the moisture-laden south-west monsoon, and leaves 200 to 300 inches of rain there, whilst 120 to 140 inches fall on the plains. Taking 140″ as a mean, in round numbers, 9,000,000 tons of water annually fall on every square mile of the Malabar Coast. It is not wonderful, then, that under the enormous energy exerted by this mass, denudation proceeds rapidly, and that flooded rivers bear seawards large accumulations of silt and sand.

Swept out to sea, were there no other forces in operation, the sand would be deposited where the river currents lost their bearing power, and each grain would add its mite to the ocean bed. There is no such repose in store for the sand grain. Rolled in by the pendulum swing of the surf, stirred up by the breakers that constantly beat on the coast, it is impelled shorewards until left high and dry by the retreat of the wave that has swept it on to the ridge of sand that forms the arm between sea and backwater. No rest yet. The blustering sea-breeze of the dry season, the stronger blasts of the south-west monsoon, urge it ever eastwards, till, buried in the stillness of the backwater, it finds at last a quiet grave.

The same surf that heaps the sand along the coast takes advantage of every inlet to carry its burden inwards. The sand-bearing power of a river, flowing at from 4 to 5 miles per hour (about the mean velocity at the mouth of a large west-coast river in flood), cannot for a moment compare with that of even a small wave breaking obliquely on the shore. Stirred up by the wave, flocculent clouds of sand may be seen carried along in suspension by the swirl, and deposited in defiance of the outward-flowing river current. This inward sand-bearing action of the surf is necessarily confined to the shores of the mouth. In the channel the stream rolls along the sand at the bottom, and thus scours for itself a sufficient waterway. If the current sets on either bank, that bank is undermined, and the sand, settling into the deep channel, is rolled outwards. On the opposite side, where the weakened current has ceased to act on the bed, wave deposits gradually push on the sand spit. Thus it is that the mouths of rivers and backwaters shift their positions. That the majority move northwards, I attribute to the fact that during the dry season, when the most marked surf deposits occur, there is generally, more or less, a south-west swell, whose oblique action causes sand to travel up the coast,* and overpower opposing river currents.

Pondering on these influences at work on backwaters, I was irresistibly led to the conclusion that the balance of power lay with the winds and waves; that rivers, aided by the waves, might bring forth backwaters, but that from their birth the last were doomed. Moreover, rivers would bring more silt into backwaters than, enfeebled by its passage through them, the current could possibly expel. Add to this the ceaseless drift of sand returned from the sea. I pictured to myself the last days of a backwater choked with sand;—how floods, each succeeding year, would be forced higher and higher, until their waters burst the confining belt of sand, and found their way straight to the sea;—the crescent-shaped bar that would then be formed, whose southern cusp would gradually emerge from the sea, and, strengthened by the gatherings of the waves, would become the protecting arm of a new backwater;—how the old backwater, now a silt trap, and still exposed to the wind-borne sand, would shallow, until at last the waters crept away, and the plough, in lieu of the keel, furrowed its surface.

If these views were, in the main, true, I argued there would be no lack of evidence, and I have been amply rewarded even by the cursory examination of the coast I have found time to make. In many cases the unmistakable sand-ridge parallel with the coast, marking the old shore line, is to be found on the inland side of broad belts of level, cultivated land, raised but slightly above the ordinary flood line of contiguous rivers. In some cases the sequence of sand-ridge and level occurs twice or thrice, whilst in one case converging rivers seem to be commencing the formation of the third backwater of their series. The first of these is completely dry, saving its drainage stream; the second, more recently deserted by the rivers, has still 2 miles of its length covered with water at high tides, and ponds scattered along the remaining portion, which is under cultivation.

On the accompanying map of this portion of the coast, enlarged from Mackenzie and Conner's survey,† I have roughly indicated the positions of the old backwaters and their bounding sand-ridges. The two systems of rivers flowing out near Kodí and Gángólí are gradually approaching each other, and will probably meet centuries hence, as they have met twice at least in bygone years. How many centuries since they last parted? It is hard to say. The Sirkar tank still contains the descendants of the choice sea-fish (now habituated to fresh water) that Tippu nourished therein for his table; but the arm of backwater leading to the spot, then deep enough to float large native craft, is now, at ebb tide, an extensive flat, whose mud is the delight of the wily curlew.

* In confirmation of my observations on this point, I have the experience of Major R. B. Branfill, of the G. T. Survey of India, whilst engaged in tidal operations at Mangalore in 1872.

† Sheets 42 and 43.

Now notice the stream that in the accompanying map rises between Kŏrăvādĭ and Kōtăh. The wavy blue line by which cartographers denote rivers may stand for a stream rapid as a Highland burn, or dull as a ditch in Holland; so it is necessary for me to explain that the stream to which I have called your attention is only a *stream* during the rains. At other seasons it is a sluggish tidal channel, navigable for small boats to near Kōtăh. The rise of the watershed north of Kŏrăvādĭ is imperceptible to the eye. Similarly, the larger stream on the east of the road, flowing into the Sītă Năddĭ from the north, is tidal where parallel to the coast-line, if not further.*

Streams running north and south as they approach the sea are numerous all along the coast, and, so far as my experience goes, they are all similar in character to those quoted above. Is it not admissible to argue their similar origin? I have, on my own part, little doubt that one and all flow along the lines of ancient backwaters, and that the coast, where this peculiarity of the rivers exists, has been built up in the manner described. It is but a narrow strip of land, after all, that has been gleaned from the surf; but the work has been short in the language of geographical change, and it is still in active progress. It is interesting to note, moreover; for, clearly, it was not the process by which the inland portion of the districts of Malabar and Canara were raised from the deep, with their strange table-like laterite hills frowning down on their smiling valleys. Who shall tell what truth there is hidden in the legend of the Indian god, whose fateful arrow, fired from the Western Ghats into the sea that then rolled against their cliffs, brought this land of beauty, another Venus, from the waves?

E. W. PRINGLE.

NOTE.—The average advance northwards of the Netravati River at Mangalore is 250′ per annum. The entrance to the harbour is now at its north end, and the two rivers, Netravati and Gurpur, flow out of the one mouth, and not as shown in Mackenzie and Conner's Map.

ON THE VEGETABLE FOUNTAINS OF THE TROPICAL AMERICAN WILDERNESS.

THE water-supplying plants of the tropical forests are often of the very greatest value to those whose steps are led, from any cause, far from the streams or known springs, and yet they are scarcely heard of beyond the districts in which they are known. To the "Ciringéro" Indian (the india-rubber collector), or of mixed blood, who often has to leave the rivers far away behind him in the search for new and more prolific india-rubber tracks, they are invaluable. He may have to cut his *picada* for days through the dark pathless woods, having to rely entirely on these vegetable fountains, one or other sort rarely failing those who know how to find them. At times, however, the sarsaparilla digger, hunter, or "Ciringéro," is reduced to drinking from the dark rain-water which has been caught in the hollow trees, and which swarms with the larvæ of midges and mosquitoes. The entire trunk of many of the forest trees is made up of chinks and crannies, especially those of the Carapanaidba nacaritiba trees. A man, however, who, of course, never goes into the forest without his long machette knife, need rarely have recourse to these. If he knows the forest, he will nearly always be able to find the large water-filled bush rope, hanging suspended from tree to tree, and falling in heavy coils to the ground; or, failing these, some of the hollow-stemmed "Imbaiiba" or trumpet trees, from the roots of which he can get a plentiful supply. Some of the natives are, however, actually so unaccountably lazy that they will rather allay their thirst with a few drops from some fœtid pool in the hollow of some rotten tree, than take the little trouble necessary to draw pure water from the vegetable fountains.

When out in the woods, I have been frequently struck with the immense distance, both in time and place, that the Indian hunters can traverse without drinking or appearing to suffer from thirst.

Of the several kinds, the most valuable to natives, who may have to remain for weeks or months in the interior of the forest, is that known as the Nambé. It takes its birth from the seed deposited in the fork of some forest tree by bird, rat, or one of the tiny squirrels which abound in these forests. Having secured foothold in some chink or crevice in the bark, and being fostered by the humid drippings of the surrounding foliage, it sends down long tendrils which descend as straight as plumb-lines until they take root in the earth far away below their lofty *perch;* there, having taken root, the plant aloft grows with increasing vigour, sending down successively stouter and stouter lines to suck up moisture from the damp ground far below, as it continues to increase in size and growth.

This living cordage is so strong that it is impossible to break or wrench it away from the parent plant seated high above in the branches of the tree. The natives, who value it greatly for making their immensely strong baskets, in which they carry all their produce from their provision grounds, or from the forest to their houses, are compelled to climb into the branches in order to cut it off above when they require it for this purpose. The "Ciringéros," or india-rubber collectors, in the interior of the forest, however, rely on it mainly for their supply of water. Having selected a large matured plant seated in some tree conveniently near their "Barraca," or house in the woods, they proceed to cut the lines some three or four feet from the ground. They then gather as many of the ends of the vines together as may be sufficiently near to each other, and, bending the ends over, tie them together with the freshly-cut points towards the ground, somewhat in the manner of a funnel. Under this they place a gourd, or one of their large earthenware pans, in order to catch the water, which soon begins to drip, and will drip on the year through, the only care required being occasionally to clear away a jelly-like substance which accumulates on the cut points of the vines.

In this manner, the "Ciringéro" and his family are as much blessed with pure cold water as though they had a spring close at hand.

This water is also excellent for bathing, whereas that supplied by the "Morotilica" bush rope, should it come in contact with the skin, causes violent itching.

* The mean rise and fall of tide on this coast is about 4′.

This treatment does not kill the plant above, which continues to send down fresh tendrils to replace those which have been cut away. Without this vegetable fountain, the "Ciringéros" would never be able to live in the heart of these great forests, far away from the streams, where they continue to tap their india-rubber trees month after month.

The "Morotilica" bush rope, or vine, although of less importance to the "Ciringéro," who is compelled to build his "Barraca," and to remain for long periods in the heart of the forest, is of more value to the hunter or the passing traveller.

In the Nambé, the water is slowly drawn up out of the ground, and must consequently be allowed to accumulate in the vessels placed to receive it. By it the dweller in the forest is provided with a never-failing daily supply, which is just what he wants. With the "Morotilica," it is different; once cut, there is an end of it, although the immediate supply is larger. This vine should be cut through (simultaneously if possible) as far up and as near the ground as possible. When it falls prone on the ground, like some immense cable of rope, it should be cut into convenient lengths of some three feet or so. So long as these pieces are carried carefully in a horizontal position, the water will remain in them, but as soon as they are tilted over the vessel in which the water is to be received, it runs out in one stream.

The same care must be taken of the several pieces until a sufficient supply is secured; or, should the object be merely a draught, the piece may be tilted up over the head, and the stream allowed to flow into the mouth. To save a considerable amount of water, the chief care must be to sever the vine above and below simultaneously. If it be cut through first below, the water flies up into the upper branchings of the vine, which are cast abroad in festoons among the branches of the neighbouring trees. On the other hand, if it be cut through first above, the water as quickly descends, and is lost in the roots below ground. The water is, of course, yielded in proportion to the size of the vine; but a large sound vine, the thickness of a man's thigh, will yield a large quantity of water. The water is rather turbid in appearance, and has a slightly aromatic taste, which makes it an agreeable drink to the initiated in the form of "Clibe" (or incuta, as they used to call it on the Orinoco), mixed with the "farina," or mandioca meal. I have already said this water is not fit for bathing purposes.

In Central America, in the country of the Waolwa Indians, I met with a similar vine or bush rope.*

Another source of water-supply is to be found in a species of "Imbauba," or trumpet tree. The hollow stem of this tree does not grow very large, and shoots up at intervals among the harder and larger forest trees. The roots of this tree do not grow deeply in the ground, but are spread abroad, above, or near the surface, so as to be easily cut up into lengths, and in them the water is contained, much in the manner of the bush rope.

H. A. WICKHAM.

* *Rough Notes of a Journey Through the Wilderness*, reviewed in the *Ocean Highways* for November 1872, p. 243.

THE FRENCH CADASTRAL SYSTEM.

THE French cadastral system consists of three series of operations. The first is exclusively a scientific process executed by geodesists. The boundaries of the *commune* are first marked out, this being then divided into sections, and the entire commune then triangulated. A survey by means of chaining and plane-tabling is then made of each *parcelle* (holding), that is to say, of every parcel or tract of land distinct from those adjoining, either by reason of a different proprietaryship or by reason of a different culture which may there prevail. When the survey of the entire *commune* has been thus completed, it is tested, and the chief surveyor causes a copy to be made, which is deposited in the Mayor's secretariat, the original being left with the executive.

Second process. As soon as the configuration and area of every holding in the commune have been determined, the next step is to estimate the net revenue of each. This series of operations is termed collectively *expertise*, and it comprises the classification of lands, their valuation, and the fixing of each individual share. The first two operations are entrusted to the members of the Municipal Council, to whom is added by law a certain number of proprietors chosen from among the most highly taxed of that category. The classification consists in determining into how many classes, according to the different degrees of fertility of the soil, every holding is to be divided. The number of classes is restricted to five in the case of the classification of soils; in the case of house property in rural communes ten classes are permissible, while in towns, boroughs, and thickly-populated communes, every house is valued separately; the division into classes is also not applied in the case of workshops and manufactories. When this classification has been arranged by the Municipal Council, the next step is to draw up a valuation tariff, and to classify the different holdings accordingly. This operation is carried out by the proprietors who are charged with the duties of classification, assisted by the controller of direct contributions. The last step, which consists in the fixing of each individual share is taken by the last-named official. He draws up statements or tables, which form the basis of the proprietary rights and of the cadastral roll. The latter contains the amount of the funded contribution which the commune has to pay, the sum of its cadastral revenue, and the proportion in which every holder contributes. The *matrix* of the rolls, which is called thus because the rolls are merely a copy thereof, enumerates collectively, under the name of every proprietor, all the parcels of land which he may own in different parts of the commune, and thus furnishes information respecting individual tenures. It only remains, therefore, to assign each individual share proportionately, according to the valuations as shown in the matrix, a task which is discharged by the administration, and is termed *expedition des rôles*.

When the roll is completed it is submitted to the prefect, who makes it legal by a decree passed in the council of the prefecture. The proprietors have the right of assisting in the process of determining individual shares, and six months' grace is allowed to them to appeal in against the classification of their holdings.

All these records, however, would eventually become obsolete and inaccurate were not changes in the ownerships of plots, changes in the class of cultivation, and other modifications, duly registered, and the contributions proportionately modified. With this object the controllers repair to the communes every year, the commissioners, charged with the duty of fixing individual shares, being present as well. All contributors are also convened so as to indicate what changes have to be registered, always supposing that these are caused by events subsequent to the determination of the classing, and uncontrolled by the will of the holder. In case of changes which modify the revenue derivable from the property, the Mayor and five of the commissioners have to certify thereto. The changes are thus annually registered, and the contributions, as shown in the matrix, adjusted proportionately, the rolls being made legal each year and forwarded to each proprietor, by order of the Prefect, a process which is termed *emission des rôles*.

Reviews.

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DANISH GREENLAND.*

DR. RINK's work comes as a welcome contribution to geographical literature. On no country in the world had we less complete or recent information than on Greenland. Crantz, Egede, and the other old writers were all out of date, while Dr. Hayes' *Land of Desolation* was a mere tourist's work, in no way complete, and in many cases very inaccurate. Detached papers on the natural history and geography we possessed, but no systematic work such as Dr. Rink's *Grönland Geographisk og Statistisk beskrevet*.

This treatise was, however, a dead letter to the majority of Englishmen—and, indeed, to all except the Danes, in whose language it was written. Moreover, it was also getting a little old. Now, at last, not only have we in English the best work in any language on Greenland, written by the only man capable of performing the task, but also one of the best geographical monographs, within the same space, extant.

Danish Greenland, though a new edition of *Grönland Geographisk og Statistisk beskrevet* is in reality a new work, re-written *ab initio*: the information entirely reworked up and condensed in a manner which leaves nothing to be desired. The condensation of the material is remarkable. Here, within the compass of 468 pages, we have the summary of the labours of a lifetime. For twenty-eight years the author has been intimately connected with the affairs of Greenland, and for sixteen winters and twenty-two summers he resided in the country as a Naturalist, travelling around the coasts, and as Royal Inspector or Governor of the southern portion of the country. He is now living in Copenhagen as President of the Royal Board of Greenland, which has direction of the whole affairs of the Arctic Colonies of Denmark. It would have been thus impossible for any one else to have written this monograph. No man living has had the same experience, and even had there been an author capable of the task, Dr. Rink's official position in Copenhagen affords him peculiar opportunities of access to documents necessary for producing a work of this nature. Though, owing apparently to the author's conscientiousness about writing one line more than what he is certain about, the book has been called *Danish Greenland*, yet, in reality, it is to all intents and purposes a complete monograph on the land of Red Erik.

As the book is itself a synopsis, we shall not attempt any analysis of it, beyond saying that in the First Chapter we have the ancient and modern history of Greenland worked out anew. Chapter II. treats of the configuration and general physical features of the country, the interior and inland ice, the floating icebergs, which Dr. Rink was the first to discover the real nature of, and the way they are detached from the glaciers, &c. In Chapter III. we have an account of the climate; in Chapter IV., a description of the general features of the surface ice, the watercourses, lakes, and sea; in Chapter V., the products and resources of the land; in Chapter VI., the capture of seals and whales; in Chapter VII., the fishes and fisheries; in Chapter VIII., historical remarks on the Greenlanders; in Chapter IX., the inhabitants, their means of subsistence; in Chapter X., the domestic life and habits of the people; in Chapter XI., their knowledge and enlightenment; and in Chapter XII., their customs and laws, with some statistics of the population. Chapter XIII. is occupied with some curious sketches of the Greenlanders, written by themselves in the Eskimo language, and translated by Dr. Rink for this work. In Chapter XIV., we have an explanation of a series of drawings by Greenlanders, which form the illustrations to this volume. Their drawings are extremely interesting. They were the unaided work of Greenlanders, and are here inserted in facsimile. As works of art they are far from contemptible, and as accurate illustrations of Greenland life, and the mental development of the Eskimo, they are inestimable. In Chapter XV., the trade, European public institutions, and European life in Greenland are sketched; and in Chapter XVI., the topography of the trade stations and their appertaining districts is given in sufficiently full detail. Then follows an Appendix on the glaciers, and the origin of the floating icebergs; on the meteorology, geology, and mineralogy; vocabulary of Eskimo names and words, antiquarian notes, miscellaneous notes, and a synopsis of the flora and fauna, which will render the work an indispensable one to all naturalists studying the northern plants and animals. There is also a map of Greenland, compiled from original materials, and containing all that is known of the country up to the present date.

The book, though written in condensed language, is nevertheless interesting reading. The sketches of Danish and Eskimo life in the country are well told, and, from the author's position, are to be received as strictly accurate in every particular; while the account of the topography and resources of the country, though containing an immense amount of

* *Danish Greenland: its People and its Products.* By Dr. Henry Rink, Knight of the Order of Danneborg, Director of Royal Greenland Board of Trade, formerly Inspector of South Greenland, Author of "Tales and Traditions of the Eskimo," &c. Edited by Dr. Robert Brown, F.L.S., F.R.G.S., author of "The Races of Mankind," &c. With Illustrations by the Eskimo, and a map. (London: H. S. King and Co., 1877).

information, related in the most unaffected manner, is never wearisome or prolix. Every chapter testifies to the care with which it has been prepared, and, from the fulness of the author's knowledge, it is evident that any one chapter, in the hands of a writer less encyclopædiac in his information, could have been easily enlarged into a volume. We have rarely seen a work in regard to which we could pronounce a more entirely satisfactory opinion. To criticise its statements would be almost impertinence. When Dr. Rink comes forward to inform the world about Greenland, it can only listen. In this field he has no rival, and it is not likely that the standard work in which he has now paid English readers the compliment of narrating the experiences of his laborious and stirring life, since the days he returned from his voyage round the world in the 'Galatea,' will be forestalled by a more authoritative treatise.

We cannot close this brief notice of a small book, but a great work, without saying how gratifying it is to find a man, whose right to speak authoritatively none will dispute, paying so warm a tribute to the labours of the Arctic Expedition in the exploration of the north end of Greenland. Dr. Rink considers that Beaumont's sledge party has, in all probability, finally determined the outlines of the country—a view in which most of those capable of giving a weighty opinion will, we believe, coincide.

TURKEY AND MONTENEGRO.*

WANT of space compels us to review these three books together, the two first of which, at least, are entitled to separate notices. In these two works we have put before us the most opposite pictures of European Turkey; which is the most correct we must leave the reader to judge for himself, only reminding him that there is generally something to be said on both sides of a question, and recommending both these books as well worth reading, and each as a useful corrective of the other.

Lieutenant-Colonel Baker, who was already acquainted with Constantinople during the Crimean War, returned there in 1874 and set out on a tour through Bulgaria, both north and south of the Balkans, to inspect some landed estates said to be for sale, and which offered favourable investments for capital; one of these, situated about eight miles from Salonica, he bought, and has since farmed, and off and on resided on it. In his preface he tells us that it seems a duty which a traveller owes to the public to reflect to the best of his ability his experience of the countries and peoples he has visited. This duty he fulfils, and the public have gained a book full of valuable information, and graphic and amusing in a high degree. The author, besides being, as a resident landowner, well qualified to write about Turkey, had unusual opportunities of acquiring information respecting the laws and customs of the country and the habits of the people, both dominant and subject.

The Colonel set out with the disposition to be pleased and to make the best of what he found. Throughout the whole of his travels he always met with the greatest kindness, civility, and hospitality wherever he went from both Muhammadans and Christians; only once had he to produce that grand document the "booyutoo," a superior kind of passport which, on Turkish soil, acts as an "open sesame." His only enemies were the insects which swarm in almost every dwelling, and feed on Turk and Christian alike. Two instances of Turkish hospitality are very charming. At Klissura—

> "Which has since suffered so severely from the massacre, I arrived at the khan, which was served by a crabbed old woman. Had she coffee? No. Fowls? No. Eggs? No. Water? Yes. What else? Bread. So I sat down in the verandah of the courtyard, to make my dinner off dry bread, and tried to imagine it luxury. I was hungry, and had eaten about two loaves, and was beginning to feel as though I was stuffed with cotton-wool, when my ever-truthful nose detected a sweet-smelling savour, as of a stew, and, looking up, I saw a highly-respectable Turk advancing with a steaming dish in each hand. This was no less than the Mudir, or Turkish magistrate of the district, who had heard of my vacuity, and had kindly and courteously hastened to the rescue with two capital meat stews. Oh, that I could perform one of those conjuring tricks I had once seen, and bring those dry loaves out of my mouth in the form they went in! But it was not to be done; and, as the young American lady said, 'I guess if I take any more I shall have to hang it on the outside!' So I could only pick delicately at the savoury dishes, and regret the past."

A little later, near Tirnova, Colonel Baker heard that a Turkish Bey had an estate for sale. This Bey, however, had no such intention; but, instead of taking offence, he invited the Colonel and his companion, Mr. Vice-Consul Brophy, to dine and sleep. The Colonel had thus the good fortune to see the interior of the house, and the way of living of a Turkish landlord.

> "The house was a large and straggling building, with a great kitchen and a sort of waiting-hall, where, as in feudal times, good fare seemed to be provided for all who came to claim it. The numerous rooms had no pretensions to luxury. The walls and long rambling passages were whitewashed, and, as usual in Turkish houses, the only furniture consisted in handsome carpets and cushioned divans."

The Bey was absent when they arrived, settling a dispute which had arisen between two Bulgarian Rayahs, who had appealed to him to act as arbiter; and before dinner he held a sort of court or levée of his tenants, who came to him for advice or assistance. There was evidently the most perfect confidence and good feeling between the Bey and his people, whether Christians or Muhammadans, and, from certain points of the conversation, it clearly appeared that the former looked up to him for protection from the exactions of their priest. This is probably an exceptional case, and our author says there are very few resident landlords in Turkey; but it exists, or did exist, before this fair country was desolated by the savage war now raging.

Colonel Baker is a strong anti-Russian, and to Russian intrigues attributes the massacres of last year,

* *Turkey in Europe.* By James Baker, M.A., Lieutenant-Colonel Auxiliary Forces, formerly 8th Hussars. Third edition. Cassell, Petter, & Galpin. London, Paris, and New York. 1877.

Travels in the Slavonic Provinces of Turkey in Europe. By G. Muir Mackenzie and A. P. Irby. With a Preface by the Right Hon. W. E. Gladstone, M.P. In two volumes. Second edition, revised. (London: Daldy, Isbister and Co., 56, Ludgate Hill, 1877).

Montenegro, its People and their History. by the Rev. W. Denton, M.A., Author of "Servia and the Servians," "The Christians of Turkey," &c. (London: Daldy, Isbister and Co., 56, Ludgate Hill, 1877).

He travelled through the whole of the country, which was the scene of those horrors. He never saw a country which looked less the seat of rebellion. The people were prosperous, peaceful, and contented, and their whole thoughts were concentrated upon education and progress. He was then informed that foreign agents were still at work, but without the slightest hope of success. The Bulgarians were, till recent events, loyal to the Government and contented, and if let alone were able and anxious to be industrious and to advance in progress. He drolly remarks that the two great "isms" are the ruin of the population of Turkey and her tributaries. If the people are let alone they are able and anxious to advance in progress, but they are not allowed to do so. The Pan-Hellenic and the Pan-Slavonic parties are each dragging at the Bulgarians and producing a constant state of agitation, a feverish excitement, and want of confidence, which is a bar to all progress. He thinks that there is no necessary antagonism between the Bulgarians and their rulers, they are of the same race, and, if let alone, would live peaceably together. Difference of religion is no bar to this, the toleration, contemptuous, indeed; but still toleration of the Turk is admitted, and the oppression the Bulgarians have suffered, on religious grounds, from the Porte, has been owing to the Turkish Governmen t being the tool of the ambition and intolerance of the Greek Church. The national Church of the Bulgarians was restored by the Sultan in 1870. We call the reader's attention to the evangelical circular of the Bulgarian Synod, at p. 52.

The schools in Bulgaria are—must we say were?—numerous and excellent, nor does Colonel Baker think the Turkish Government in any way hostile to education. The gymnasium at Philippopoli derives its funds from a direct tax or compulsory school-rate levied by the Ottoman authorities under a special firman. He adds that the Ottoman authorities frequently attend, by invitation, the public examinations and delivery of prizes at the Bulgarian schools.

The Colonel gives a *résumé* of the history of the Turks and their subject races, which will be useful at the present juncture; he is careful to distinguish between the corrupt Government and the nation of the Turks, the three great vices which poison the Government of Constantinople—apathy, procrastination, and venality—he traces from the Byzantine Empire. The nation at large, as shown by the Turkish rank and file, is distinguished by patience, discipline, sobriety, bravery, honesty, and modesty.

"To these qualities," says the author, "I may also add that of humanity, although I know it will excite an indignant exclamation from many at the present moment. But look at the Turkish soldier in private life, and you find him gentle and kind to children and women, and exceedingly fond of animals. His first thought, after a long and tiring day's march, is his horse. As soon as he has made the animal comfortable, then he thinks of the man."

The chapters on the Army and Navy, on Taxation and Agriculture, are valuable, and that on "Turkey as a field for Emigration" original; but at present the subject of emigration must remain in abeyance, till the country is relieved from the curse of war.

The late Miss Muir Mackenzie (afterwards Lady Sebright) and Miss A. Paulina Irby published, in 1867, their travels in the Sclavonic provinces of Turkey. This work Miss Irby has revised, and added to it three chapters on Bosnia in 1875, 1876, and 1877. The prolific pen of Mr. Gladstone has contributed a Preface to this edition. We are inclined to think this is to be regretted, as it gives something of a partisan character, which it is desirable to keep out of books written for the information of the public. We cannot doubt that Miss Irby's wish is to state facts as they are, and the strong views of the late Premier have been published so widely that they give to all in which he takes a part a one-sided character.

It must have required unusual courage and enterprise on the part of these ladies to undertake the adventurous journey they did in 1863 and 1864, and we believe it was the interest inspired by what she saw of the Serbs in her travels that led Miss Irby to the philanthropic works amongst them which have placed her name among those who are at the present time most justly honoured for their good deeds.

Miss M. Mackenzie and Miss Irby begin the recital of their travels at Salonica, and, except a visit to Rilo Monastir, they travel over entirely different ground from Colonel Baker. After visiting much of Bosnia, they pass to Northern Albania, and end with Montenegro. The incidents of their journeys are minutely and pleasantly related, and interspersed with much interesting information about the people, their history and legends. Although these ladies state that one contracts in the East the habit of crediting but half what one hears, yet their ears were always open to receive accounts of Turkish misdoing. They seem themselves, however, to have met with civility and attention from the Turkish authorities, to whom the sight of two unmarried women travelling without any male relation must have seemed strange, not to say incorrect.

Perhaps the most interesting part of this book is the visit to Montenegro. Those who go there must be prepared to rough it, and the roughness, which by the cold of winter was increased to positive hardship, was very gallantly borne by these ladies, who were certainly superior in courage and enthusiasm to the Prince's French doctor—

"who came to see us the morning after our ride to Rieka, and having ascertained that we were none the worse, poured forth the recital of his own grievances. 'Je vous dirai, mesdames,' he began, 'that you must have excellent constitutions not to have suffered from the effects of that storm. For myself I confess that life in Montenegro does not suit me; for the last three weeks I have had a cold; I am lodged with my wife aud child in a single room. When it is bad weather we cannot go to dinner at the palace. Yesterday evening, for example, it was impossible to cross the road. During last night, from the violence of the tempest, the house rocked to its foundations.' We could not resist answering that his experience of life in Montenegro doubtless increased his admiration for the Montenegrines, who, during centuries, had borne what he bore, and worse, rather than submit to the Turk. 'Pardon,' interrupted he; 'that is a sentiment to which I do not aspire. Often I ask myself, Qu'est-ce que c'est que la liberté Monténégrine? Cannot any one be independent who chooses to dwell on the top of a rock? I avow, rather than cultivate such liberty, I would a thousand times be subject to the Turk.'"

Of this most interesting people, the Rev. W. Denton gives an account which has previously appeared in the *Church Quarterly Review* and in *Good Words*. He has himself travelled in Montenegro, and he quotes largely from other travellers. He concludes

with a short history of the principality. For nearly 400 years that history has been one long-continued struggle with the Turks. First under their hereditary princes, then for 180 years under the Vladikas, or prince-bishops, and, lastly, under a restoration of hereditary lay princes, the almost uninterrupted war has continued. Cramped up in their rugged mountains, debarred from communication with the sea by the jealousy of Austria, made the tool of other States—first Venice, then France, and lastly Russia, who have none of them been of use in the hour of real need, this gallant people owe their liberty to their own prowess and unconquerable spirit. Mr. Denton's little book is a useful one, and will, we doubt not, be widely read.

BULLETIN DE LA SOCIÉTÉ DE GÉOGRAPHIE DE PARIS.

April 1876—*April* 1877.

THE monthly *Bulletins* issued by the Paris Society during the year under review contain many papers of considerable interest. We cannot do more, in a brief notice like this, than indicate the subject-matter and scope of the more important of them.

Foremost among these we must draw attention to a disquisition on the Basque people, by M. V. Derrécagaix, of the French Staff. The author describes the present extent of the race and its site; he notices the principal works on its origin and history, and the different theories that have prevailed regarding this singular people. Among these he draws special notice to that elaborated by M. Augustin Chaho, a Basque by birth, who, in his *History of the Basques*, has pointed out that four names of tribes and twenty-five names of towns mentioned by Strabo and Ptolemy as existing in Northern Africa are to be found at the present day in the Basque country. This discovery induced M. Chaho to look for some analogy between the Sanskrit and *eskuara*, or ancient Basque tongues, and he has picked out about fifty words, which include such terms as mother, father, son, water, fire, east, hand, sun, &c., and which are *almost identical* in the two languages. This is a very important discovery, as Mr. Freeman and other historians have certainly denied that the Basques were of Aryan origin. M. Chaho's theory is that the Basques are descendants of the Iberi, who migrated, upwards of 2400 years before Christ, from Central Asia, the cradle of the Aryan race, by way of Northern Africa, where they have left traces, into Western Europe, where they were seen by the Phœnicians in the 18th and 19th centuries preceding the Christian era.

An article, by M. de Sainte Marie, on Herzegovina, descriptive of several routes through the province, of its antiquities, and of the manners and customs of the people, claims attention. M. J. B. Paquier devotes a thoughtful article to a consideration of Marco Polo's route across the Pamir, between Balkh and Yarkand. He is disinclined to believe that Marco Polo visited Pashai and Chesimur (Chitral and Kashmir), owing to the meagreness of the details he gives about the country, and his silence respecting the majestic Hindu Kush, which he would have had to cross. M. Paquier also argues that Ser Marco could not have followed the same route as that followed by Hwen Tsang, from Badachan eastward, as his description of the fertility of the pasturage, beside the river, agrees much more with the description given by Captain Trotter's Munshi of the Suchán River, than the bleak picture of desolation given by Hwen Tsang and Captain Wood of the route followed by them. A lake, of the dimensions of the Dragon Lake of the Chinese pilgrim, would most probably have been noticed by Marco Polo, had he passed it. M. Paqueir goes on to trace the Venetian traveller's route by way of the Vallis Comedarum (the Shignan Valley), the Turris Lapidea, and the Statio Mercatorum. He does not consider that Marco visited either Samarcand or Kashgar, and this he supports ingeniously by the language used at the commencement of chapter xxv., as constrasted with chapters xxxiii. and xxiv., and which seem to prove that Marco Polo tarried in Badakshan to describe some of the better-known cities in the vicinity, and then proceeded on his journey towards Yarkand. Among the other articles are a description of certain antique sculptures found in Lower Morocco, and a careful and detailed account of the vilayet of the Danube, by the French Consul at Rustchuk, from which it appears that the whole population of this vilayet amounts to about 2,152,500. We have five letters from the pen of the Abbé Desgodins, on the geography of Indo-China and the south-east limits of Tibet. Bonga, which, according to Schlagintweit, is situate about 28° 30′ N. latitude, the Abbé's information leads him, with some confidence, to place south-west of Yerkalo, the latitude of which has been ascertained by him to be 29° 2′ 40″ S. The Abbé goes on to disprove the idea that either the Makong or Salwen can have anything to do with the Brahmaputra, and with regard to the mountains separating the first two rivers, he states that, from his own observation, he can testify to the existence of such a chain, as well as to the existence of another between the Kinsha Kiang and Mekong; and that, from native information, he is inclined to believe in the existence of a third mountain range west of the Salwen, and forming the watershed of the Irrawaddy. The Abbé is further of opinion that these two or three mountain chains have no connection with the Himalayas system, but are probably the southward prolongation of the mountains which bound Tibet, on the north, and turn abruptly southward at about the 95th meridian of longitude. Dr. Harmand records the results of his journey up the Mekong River as far as the Khong Island, and his excursion thence into the Siamese and Cambodian provinces westward. The recent census of India, and the publication of various statistical works concerning the country, gives opportunity for a paper on the density of population in India, by M. Paul Vidal-Lablache, and the progress of M. Savorgnan de Brazza's expedition up the Ogowé River in Western Africa, forms the subject of three articles. To the last *bulletin* which falls within the scope of this notice, M. Ch. Maunoir, secretary to the Central Commission, contributes his annual review of geographical events during the year 1876.

The notes and communications which appear in each number are far too numerous to enable us to notice them separately, but they, in combination with several most excellent maps, prove that, for the variety and interest of its contents, this geographical publication is surpassed by none other.

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HANDBOOK OF THE SEAT OF WAR. Edited by *Alexander Mackay, LL.D., F.R.G.S.* (London: Simpkin, Marshall & Co., 1877).

WE commend this practically useful little work to all interested in the progress of the war now being waged between Russia and Turkey. It has been compiled to enable the readers of war telegrams in the daily newspapers, and who have neither the time nor the opportunity to consult encyclopædias and gazetteers, to follow intelligently the movements of the rival armies. It contains brief descriptions of the localities occupied, or likely to be occupied, by either army, and, with the view of making the relative positions of the contending forces still clearer, sketch maps or plans of the occupied districts have been introduced. A good general Map of the Seat of War is also appended. The low price at which this handy work is issued places it within the reach of all.

Cartography.

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INDIAN MARINE SURVEYS.

THE organisation of the very important department of Indian Marine Surveys, under the superintendence of Commander A. D. Taylor, has been so closely followed, step by step, in the pages of the *Geographical Magazine*, that we need only refer to these for a full account of it, especially to the article in the numbers for July, 1874, and April, 1877. Its officers are now vigorously prosecuting the heavy task of making up for the twelve years of neglect which followed on the cessation of the surveys of the Indian navy, in extending the yet incompleted charts of the coasts, and in re-surveying those ports and harbours in which changes are constantly being effected by natural and artificial means.

The first fruits of their work, in the form of a number of admirable charts of important points of the coast of India, are now before us.

We have first two sheets of a most useful and carefully executed general chart of the coasts of India, on the scale of about 20 miles to an inch, compiled by Mr. Carrington, superintendent of the drawing branch of the survey in Calcutta, from the original surveys made by the officers of the Indian navy from 1835 to 1862, and engraved at the Admiralty, at home, under the direction of Captain Evans. A most remarkable physical feature of the great Indian promontory, brought out very distinctly by this chart, is that of the wide level submarine plateau, of less depth than 100 fathoms, which extends all along the western coast from off the mouths of the Indus, where it is a hundred miles broad, to Cape Comorin. On the landward side the Western Ghauts rise suddenly to an average height of 4,000 feet, and seaward, immediately beyond the edge marked out by the line of 100 fathoms depth, there is a second sudden step or descent to depths of 6,000 and 12,000 feet.

The chart of the open roadstead of Kolachel, never before surveyed, whence the coffee of Travankor is exported, is a most important work, and the value of the new survey of the roadstead of Madras can hardly be overrated. The latter chart shows the limits of the proposed harbour of Madras. The continual alterations and changes of shape in the channels, sand spits, and mud flats of the mouth of the Godavery, effected by the conflict between the freshets of the river and the heavy monsoon surf of the Bay of Bengal, will illustrate the absolute necessity for uninterrupted attention and the periodical examination of such points by surveying vessels on this coast. The charts of a few years back are not only useless, but misleading.

Of all the inlets of the Indian coast there is none of greater importance than that of the Hoogly mouth of the Ganges, the great highway to Calcutta, dangerous on account of its shifting sands and rapid river current. Accordingly, no work could have been of greater public utility than that of a minute survey of the shoals which lie in the bed of the river round Hoogly Point, a task which has been accomplished by Lieutenant Coghlan and six other members of the surveying staff.

Lieutenant Jarrad's chart of the approaches to Rangoon River is another most notable work, completed in the face of formidable difficulties. While engaged on this survey, Lieutenant Jarrad wrote:—"Nature appears to have set her face against any interference with the Rangoon River and its secrets: when it does not blow, and the tides take off, we get fog so thick that we cannot see the forepart of the ship. The tides are so strong that tide-poles are continually being washed away; the steam cutter cannot force the strength of the tide, and we can only sound for about an hour at slack water." In spite of this, however, the chart is here, and the river mouth, over an area of more than 200 square miles, has been sounded over in every corner.

Farther south, we have now for the first time a reliable chart of the Tavoy River, one of the chief central inlets of the Tenasserim Province. Very interesting, as an evidence of the advancement and enlightened policy of the ruler of the independent country of Siam, the coast-line of which continues that of the British Burman Provinces, are the two charts named last on our list, those of Salang Island and its chief harbour, from surveys made by Commander Richelieu, of H.M. Siamese Navy. The first is not only a chart of the coast of Salang, but is filled in on a minutely-detailed map of the interior of the island.

All these charts, whether engraved at home, or photo-zincographed in Calcutta at the office of the Surveyor-General, are produced in a strong, clear fashion, with large lettering and sounding figures, that may be read easily under the most adverse circumstances of rough weather or dingy cabin lights.

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1. India—West Coast. Sheet I. Karáchi to Vingorla. Compiled from surveys made between 1835 and 1862, by R. C. Carrington, 1876. Admiralty, February, 1877.

2. India—West Coast. Sheet II. Vingorla to C. Comorin. Compiled from the latest Government surveys, by R. C. Carrington, 1876. Admiralty, February, 1877.

3. India—West Coast: North Konkan: Sketch of the entrance to the Rajpuri River. By Navigating-Lieutenant W. P. Haynes, R.N., 1876. Scale, $\frac{1}{30000}$. Calcutta: Marine Survey Department, July, 1876.

4. India—West Coast: Sketch of Quilon Roads. By Lieutenant A. Dundas Taylor, I.N., 1858. Scale, $\frac{1}{30000}$. Calcutta: Marine Survey Department, April, 1876.

5. India—West Coast: Travankor: Kolachel Roadstead. Surveyed by M. Chapman, I.N., 1875. Scale, $\frac{1}{7920}$. Calcutta: Marine Survey Department, November, 1875.

6. India—East Coast: Madras Roadstead. Surveyed by Navigating-Lieutenant F. W. Jarrad, R.N., assisted by Mr. P. J. Falle, October 1876. Scale, $\frac{1}{5440}$. Calcutta: Marine Survey Department, December, 1876.

7. Bay of Bengal: Coringa or Cocanada Bay, showing the Northern Godavery mouths. Surveyed by Navigating-Lieutenant G. C. Hammond, R.N., June to August, 1875. Scale, $\frac{1}{30000}$. Calcutta: Marine Survey Department, January, 1876.

8. Bay of Bengal—Hoogly River: Luff Point to Anchoring Creek, showing the James and Mary Shoals, and the entrance to the Roopnarain. Nat. Scale, $\frac{1}{1\,2\,1\,10}$. Surveyed by Navigating-Lieutenant J. E. Coghlan, R.N., April and May, 1875. Calcutta: Marine Survey Department, January, 1876.

9. Pegu—Gulf of Martaban: Approaches to Rangoon River. Scale, $\frac{1}{14400}$. Surveyed by Navigating-Lieutenant F. W. Jarrad, R.N. Admiralty, July, 1877.

10. Bay of Bengal—East Coast: British Burma: Tavoy River, from a sketch by Lieutenant R. Moresby, late Bombay Marine, with additions by Commander A. Dundas Taylor, late I.N., Superintendent of Marine Surveys in India, 1876. Scale, $\frac{1}{9\,4\,2\,7\,0}$. Calcutta, October, 1876.

11. Bay of Bengal—Coast of Tenasserim: Kopah Inlet. Scale, $\frac{1}{60000}$. From a sketch by Commander A. Dundas Taylor, 1876. Calcutta, December, 1876.

12. Siam—West Coast, Malay Peninsula: Salang Island (Junk-seylon). Surveyed by Commander A. de Richelieu, H.M. Siamese Navy, 1876. Scale, $\frac{1}{30000}$. Calcutta, February, 1877.

13. Siam—West Coast, Malay Peninsula: Junk-seylon, East Coast: Puket or Tonkah Harbour. Surveyed by Commander A. de Richelieu, H.M. Siamese Navy, 1876. Calcutta, October, 1876.

Log Book.

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Forest Conservancy in New Zealand.*—Captain Campbell-Walker deserves the thanks of all who take an interest in the future of New Zealand for his efforts to bring home to the colonists the importance of the question of Forest Conservancy, and to induce them to put an end to the heedless waste which is gradually thinning the country of its trees, and leading to future disaster. Forestry is a subject about which, as a rule, people are wofully ignorant, and it is not, therefore, surprising that Captain Campbell-Walker had to treat the audience he addressed to the elements of the subject, into which it is not our intention to follow him. All he says is admirably put, and should bear good fruit. Were it not for the bearing of forests upon the permanent water supply, upon the agricultural wealth of the country, and the health of its people, forestry might be left to private enterprise, and individuals might be allowed to hack and hew to their hearts' content; or, were it not for financial considerations, forest conservation would meet with less opposition from those who regard only present gains, and would leave the future to remedy the follies of the past. These two aspects of the question, the climatic and the financial, form the text of what Captain Campbell-Walker has to say, and he emphasises the lesson he would teach by alluding to the experience of other countries, especially that of France, which has suffered cruelly from the effects of a long course of denudation, and is now trying energetically to retrieve the errors of the past.

The area of forest Crown lands in New Zealand is estimated at 12,000,000 of acres, out of a total of 66,000,000, and it is satisfactory to learn that no damage has yet been done to the climate of the country, or its water supply, by the extensive clearings which have taken place: indeed, Captain Campbell-Walker estimates that probably nine-tenths of the forests that remain may in time be spared, if the clearances be judiciously carried out. While the permanent reserves are being selected—a work, of course, requiring time—Captain Campbell-Walker would have the tracts not suited for that purpose thrown open in such a way as to secure the timber its marketable value, and he is rightly opposed to the present system, by which vast quantities of valuable timber are sacrificed, merely to attract settlers to localities which are really not ripe for settlement. He would regulate the lease of blocks of the Government Forest to saw-millers, and from every one else cutting Government timber for firewood, the upkeep of fences, &c., he would levy light dues in the shape of annual licenses. These regulations are so simple and expedient that one wonders there should be any hesitation in adopting them. Young communities are much to be envied for the opportunities they have of avoiding the mistakes of past generations. It remains to be seen whether New Zealand will profit by the timely warning now offered her.

Austrian Scheme for Arctic Research.—We are glad to perceive from the *Exploration* that the Austrian scheme for the establishment of stations of observation within the Arctic circle, as an aid to Polar exploration (see our number for April 1876, page 104), has again been brought forward, and this time appears likely to be carried into practice. Lieutenant Weyprecht, who commanded the Austrian Polar Expedition that discovered Franz-Josef Land in 1874, and Count Wilczek, one of the promoters of that Expedition, have announced to the Royal Society of Meteorology of Utrecht that they intend to undertake an expedition to the Arctic regions, which will be away for about twelve months, and that they intend to establish their station of observation in one of the northern havens of Novaya Zemlya. In addition to this station they recommend the establishment of several others at various points, choosing by preference points easily accessible, but situated in as high a latitude as possible. These conditions are most satisfactorily fulfilled in Spitzbergen, in about 80° N.; on the Siberian coast, near the mouth of the Lena, in about 71° N., one of the New Siberian islands being preferred; at the wintering station occupied by Maguire, near Point Barrow, east of Behring Strait; at Upernivik, in West Greenland; and, as intermediate stations, Novaya Zemlya, at about 76° N., and a station on the east coast of Greenland. A subsidiary station in Norwegian Finmark would be necessary to connect the stations in Spitzbergen with those on the continent of Europe. It would also be of the highest importance to establish some stations, or at least one, on the Antarctic borders. The most favourable points appear to be Cape Horn, the Kerguelen or Auckland Islands, or one of the islands to the south of the latter. The nearer the stations are to the Pole the more important would they, of course, be. Synchronous observations made at a series of stations so near the two Poles would throw valuable light upon the still very obscure subject of terrestrial magnetism and the theory of the Aurora Borealis. Such observations should have the first place, while important observations in other departments could be made, all in the end having a strong practical bearing upon meteorology. Each expedition ought to be allowed to determine for itself the extent to which observations should be carried relative to geography, natural history, and the physical sciences, for which simultaneous observations are of less importance.

The American Arctic Expedition.—We called attention to Captain Howgate's scheme for polar exploration in our number for April last. The expedition has since been successfully organized, and the final departure took place last month from New London, for Cumberland Island, the first stopping-place *en route* to Smith Sound. The winter will be spent on this island on account of its coal deposits, and the time will be occupied, not only in meteorological and other scientific observations, but in equipping the future colony by engaging some dozen families, with their sledges and a full supply of dogs, together with abundant clothing, to be made up by the native

* *State Forestry:* a Paper read before the New Zealand Institute, Wellington, March 17, 1877. By Captain Campbell-Walker, F.R.G.S., Staff Corps, Conservator of State Forests, New Zealand.

women. Next summer the 'Florence' will transport the entire company to Disco, where they will be transferred to a ship which is expected in June, bringing colonists sent out under Government auspices, with Lady Franklin Bay (the 'Discovery's' head-quarters) for their final destination. The present outfit is wholly private, except that the Signal Service Bureau has lent some of its instruments, and Commodore Ammen, of the Bureau of Navigation, has provided his combination sledge and safety raft. Captain Howgate has Captain Geo. E. Tyson, of 'Polaris' fame, for his sailing-master; Mr. Ludwig Kumlein, for his naturalist; and Mr. O. T. Sherman, of Providence, for his meteorologist and photographer. It is expected that Congress will assent to an appropriation of $100,000 next session for the Howgate colony.

Colonel Macgregor and Captain Lockwood in Eastern Persia.—No news has been received by the India Office of the recent journey made by Colonel Macgregor and Captain Lockwood through Khuzistan and Baluchistan to India. In addition, however, to the interesting discovery of an active volcano south of Sistan (chronicled in the Log Book of our last number), we learn some further details respecting their journey from a letter received by Dr. Petermann from Major St. John, R.E. This officer, writing under date 12th June, remarks that though Colonel Macgregor and Captain Lockwood were not in a position to make detailed surveys, they have yet confirmed the existence of the great mountain range running westward of the Sistan Lake, as well as the fact that there are three smaller ranges parallel with the southern bend of the Helmund. Another interesting discovery lies in the fact that the three rivers, the Mashkid, Lura, and Budur, lose themselves in different *hamuns*, or depressions of the desert, and neither unite one with the other, nor with the great Sistan Swamp. These *hamuns* appear to correspond pretty closely with the Persian *kawirs*. The India Survey Department is engaged on a tolerably large scale map of the Khan of Kelat's dominions, which it is hoped will embody all these interesting explorations.

Exploration in Eastern Turkistan: Kurapatkin and Prejevalsky.—M. C. de Ufalvy has communicated to the Paris Geographical Society details of Captain Kurapatkin's journey in Kashgaria. This officer started from Osh (Ferganah) on the 17th (29th) July 1876, and crossed the Terek pass leading into Kashgar. He makes out this pass to be 12,209 feet, or lower than the usually received height (12,600 feet), and practicable throughout for an invading army with cannon. Captain Kurapatkin was wounded by Kara Khirgiz close to Gulcha, and forced to return to Osh. After crossing the Terek again, he arrived at Kashgar on the 8th November (N.S.). Here he was put under temporary arrest by Yakub Beg's son, Kuli Beg, but was soon released, on the promise of leaving the country forthwith. This stipulation he did not comply with, and, following the Kashgar Daria, he passed Maralbashi (the furthest point reached by Captain Biddulph, of Sir D. Forsyth's party) to Aksu. For 42 miles beyond Kashgar the country is cultivated. A special manufacture in these parts is a thick kind of cloth called *matta*, which is said to be exported to the extent of 333,000*l.* annually. The river is fringed on either hand, for more than 120 miles, with thick forests of *populus diversifolia*, which attain a height of about 12 feet. Tamarisks are also frequent, and a strong species of salt is plentiful. Maralbashi is a strong fortress, and important from a strategic point of view, as it commands the Kashgar, Yarkand, Khotan, and Asku roads. Here and there are small cultivated oases, tenanted by six, seven or more individuals engaged in the postal service. Kurapatkin arrived at Kurla on the 10th January 1877, after leaving the banks of the Kashgar Daria and crossing a stony and sandy desert. Kurla, though not to be found on existing maps,* is an important placè of some commercial note, while Karashahr is a mere hamlet. From Kurla to Lob-nor it is 250 miles. Kurapatkin's brother and M. Wilkens, a naturalist, visited the lake Bostang-nor of our maps, the real name being Baratch-kul. Yakub Beg was at Kurla at the head of 17,000 of his troops. M. Ufalvy gives some particulars respecting the "six towns" of Altishahr (as Kashgaria was called in the 15th century), which differs in some respects from the account given by Mr. Michell at page 195 of our volume for 1874, and he adds some particulars of the late Yakub Beg's life. The regular army, he tells us, are 35,000 in number, and pretty well armed and disciplined. They have 4000 breech-loaders, eight European mountain guns, and twenty others of native make. The troops are described as generally discontented, and receiving neither pay, uniform, nor rations, but the Chinese army, it is said, is no better off. Captain Kurapatkin left Kurla on the 18th February, and returned to Osh on the 13th April last.

Colonel Prejevalsky does not appear to have sent his promised telegram from Kuldja as yet, though he succeeded in arriving at that place in safety. M. Ufalvy communicates several details respecting Prejevalsky's explorations which have not found their way into the meagre telegrams reproduced in the Russian journals. The Colonel started from Kuldja, and, having ascended the valley of the Tekes, crossed over into that of the Yuldus to Kurla. Here he was detained in durance by the Governor for eleven days, whence, on release, he started for Lob-nor. He crossed the Tarim River where it was 66 yards wide and very deep. At a distance of 250 miles from Kurla, and south of Lob-nor, he came upon a village called Chargalik, inhabited by sixty-six families, the people of which call themselves Lob-nortsi; they are a peaceable folk of Kalmuk origin, and are exclusively fish-eaters. Lob-nor is an enormous marsh surrounded and partly overgrown by thick bushes. Prejevalsky killed a tiger there and many birds. Traces of Russian dwellings were found, as anticipated; about sixty Siberian families had migrated thither about ten years ago, and remained there for six or eight months. They then departed in the direction of Hami, and have since been lost sight of

* This is a misapprehension. Kurla will be found on the "Preliminary Map of Eastern Turkistan," accompanying Sir Douglas Forsyth's narrative of the Yarkand Mission. We have not yet, by-the-bye, seen the complete map of the region referred to. It would be a most welcome document to geographers. But perhaps it might now be worth while to wait for Prejevalsky's results.—[ED. *G.M.*]

About 120 miles south of Lob-nor, Prejevalsky came upon a range called the Altyn-Tag, which rises to a height of more than 10,000 Russian feet, and appears to be the outlying spurs of a more important range. It was in these parts that the wild camels were met with.

These camels (as it appears from a letter published in the *Globus*, from Herr Albert Regel, dated Kuldja, 25th May (6th June, N.S.), are about the same height as tame ones, but their hair is much shorter and thicker. Herr Regel saw Prejevalsky's interpreter and ascertained that the expedition has produced more geographical results than specimens and collections. Prejevalsky proposed to stay for a while by the Kunge, the right affluent of the Ili River, and then to start from Kuldja for Tibet, by way of Chinese territory.

Lhasa.—We are sorry to perceive from the Indian *Pioneer*, of the 22nd June last, that the proposed expedition to this mysterious and sealed capital has now fallen through beyond hope of success. We have been aware for nearly a year past that negotiations were on foot between Mr. Ney Elias (an *attaché* of the Indian Foreign Office) and the Indian Government, for a private attempt to penetrate, if not to Lhasa, to certain other interesting quarters of Tibet; but as the enterprise was a dangerous and delicate one, we refrained, in the interest of the undertaking, from publishing anything on the subject. As, however, the matter is no longer a secret, it is necessary, in the interests of future similar projects, to observe how the present one has been wrecked. The Government of India were not unwilling at the outset to open out relations with Tibet, but their method of procedure certainly forces on us the impression that they did not wish to appear in the matter until success had been assured. They had at their elbow an experienced explorer in Mr. Elias, and offered him the opportunity of carrying out the project as a private individual, at his own risk and responsibility. The offer was accepted, on condition that all arrangements for the journey and negotiations with the Chinese Government should be left in the traveller's own hands, to the end that he might not be suspected of being a Government agent. Unfortunately, this *modus operandi* did not commend itself to the authorities. Her Majesty's Minister in China was communicated with, the project was placed before the Chinese Government, and the "private traveller" was, in plain English, handed over to the "enemy."

It so happened, however, that just at that time (Sept. 1876), the Convention of Chefoo was being negotiated, and, on the basis of Mr. Elias' project, a separate article was inserted providing, officially, for a mission to Lhasa. Nothing could have come more opportunely to retrieve the faults of the Indian Government: Mr. Elias would go with the full sanction of the Chinese Government; but as the convention was only to come into force six months after conclusion, a delay occurred, during which time it was settled between the Indian officials and the Peking Minister that Mr. Elias, not being a regularly-appointed officer of Government, was not entitled to use the official passport, and, as a private exploration was now out of the question, the matter must be dropped.

Now, either a person is an officer or he is not; and if he is so far considered an officer that his plans for a private journey must be placed before the very people from whom it was desirable to keep them secret, it is hardly clear why he should not be entitled to the use of a safe-conduct when obtained from those people by negotiation. However this may be, the question of an expedition is at an end, and the field of Tibetan exploration is left open to our Russian friends, who know how to manage these things far better than we do. The *Pioneer* thinks there may yet be a chance for our Government to retrieve, but it will not be easy to find a better opportunity than the one so unfortunately thrown away.

Expedition through Mongolia.—M. Potanin started on his expedition to explore that part of Mongolia between Zaissàn and Lake Kossogol, on the 1st of April last (N.S.). He expects to complete his examination of Mongolia, as far as it borders on the Siberian frontier, in the space of two years.

The Portuguese Province of Mozambique.—According to G. A. Pery, in the *Geographia e Estadistica Geral de Portugal e Colonias* (Lisbon, 1875), the following nine districts form together the East African province of Mozambique:—

1. *Cape Delgado*, consisting of the Querimba Archipelago, and the following possessions on the mainland:—Mazimba (Mucimba), Pangane, Lumbo, Quissanga, Montepes, Areemba, and the colony of Pemba.

2. *Mozambique*, consisting of the island of Mozambique, and a portion of the opposite mainland, with the hamlets of Mossuril, Cabaceira Grande and Pequeña, and the territories of Sancul and Quitangonha. The rule over the people of the surrounding forests is only nominal.

3. *Angoxa* (Angosha) from the Rio Sangage (Sangaje) to the Quizumbo (Quizungo), including the little town of Angoxa and the Angoxa and Primeira Islands (Casuarina, Fogo, Silva, &c.).

4. *Quelimane*, from the Rio Quizumbo in the north to the E. Luabo mouth of the Zambesi, in the south, and the Rio Chire (Shire) in the west.

5. *Sena* (Senna), bounded on the north by the Rio Chire (Shire) and a portion of the Zambesi; in the west by the Aroenha (Luenya; in the south by the small river Mussunguri and the heights of Barue.

6. *Tete*, bounded on the north by the Rio Aruangua (Loangwa); on the west by a part of the Zambesi and the Rio Siniati (Sinyati, 29° E.; Livingstone); on the south by the Serra Fura and the heights of Manica; on the east by the district of Sena.

7. *Sofala*, extending along the coast from the Rio Mussunguri to Cape St. Sebastian, including the island of Chiloane and the Bazaruto Archipelago.

8. *Inhambane*, bounded on the west by the Transvaal Republic.*

9. *Lourenço Marquez.*

* See, however, St. Vincent Erskine's account in the *R. G. S. Journal*, 1875, p. 53:—"Inhambane possesses the rule over a tract of country north and south of the town about 70 miles long and 15 broad, whereas the Government at Lorenzo Marquez can call nothing their own beyond the space within range of their cannon."

Romolo Gessi.—From a Bolognese serial, entitled *Pagine Sparse*, we learn that this Italian traveller, the circumnavigator of Lake Albert Nyanza, was born at Ravenna in 1830, and that at an early age he was sent to Vienna, to the Military College of Wiener Neustadt. He was always of a roving, ambitious temperament, and took part in the events of 1848, during which he was taken prisoner by the Austrians, and, after temporary durance in Transilvania, was exiled into Rumania, whence he and his fellow-companions were not long in making their way back to Venice. After the fall of the city, Gessi entered the mercantile marine, and, in the course of some adventurous voyages in the Mediterranean, made the acquaintance of Mazzini at Corfu. In 1854 he took service in the Turkish contingent against the Russians, and was present at the Alma, Inkermann, Balaklava, and the taking of Kertch. On the conclusion of the war he embarked for Circassia, where he stayed till his corps was utterly routed. Toward the close of 1856 he was occupied in raising sunken vessels at the Sulina mouth of the Danube, and after that he enlisted in the Polish Legion, which was attacked and made prisoners while endeavouring to make its way to Poland from Turkey. Gessi returned to Turkey, and there made the acquaintance of Colonel Gordon, who, when appointed to the governorship of Central Africa, hastened to avail himself of Gessi's services. His subsequent successful exploration of the Lake Albert Nyanza is well known, and was described by us in our number for September, 1876, p. 247. He received a warm welcome among his fellow-countrymen in Bologna in July last, and has already started for Colonel Gordon's head-quarters in Central Africa.

Journey along the Southern Coast of New Guinea.—The Rev. S. Macfarlane has communicated to the Royal Geographical Society particulars of a journey made by him to the China Straits in New Guinea in March last in the steamer 'Ellangowan.' After steaming through Basilisk Passage the 'Ellangowan' anchored in Hood Bay, where the natives visited them in large numbers, and were very friendly. From these they ascertained that a river runs into the lagoon at the eastern side of the Bay, and that it takes its rise behind the Astrolabe Range. The lagoon is described as about 15 miles in circumference, and a splendid anchorage, while the river was about 80 yards wide and 8 feet deep. Journeying eastward the 'Ellangowan' anchored in Cloudy Bay, and thence proceeded towards Dufaure Island, close to which is a fine harbour about 8 miles by 4, and from 8 to 10 fathoms deep. Along the coast between Amazon Bay and China Straits the natives are more numerous, more intelligent and healthy, and altogether compare favourably with the natives to the westward. Although Mr. Macfarlane did not feel justified in making detailed surveys, he was enabled to detect many necessary modifications in the charts, and is of opinion that there is still plenty of work for one of Her Majesty's ships along the southern side of the peninsula. Mr. Macfarlane was unable to go beyond the China Straits, as his supply of hoop-iron, which is eagerly sought after by the natives, ran short. He considers that the voyage has been a most successful one, resulting in the discovery of two splendid harbours, besides several good anchorages along the coast. The natives were found to be friendly, numerous, and apparently had plenty of food. They brought some flax of a superior quality, which eventually might become an article of commerce. Mr. Macfarlane remarks that the eastern end of the peninsula with the islands in the vicinity, including the d'Entrecasteaux group, will form a much finer field for missionary operations than the Gulf with its dangerous navigation, deadly fever and savage cannibal inhabitants.

Kanitz's New Map of Bulgaria.—The long-expected map, showing the result of F. Kanitz's travels in Bulgaria (1870-1874), is reproduced in Dr. Petermann's *Mittheilungen* (No. IX., September). It is reduced from Kanitz's original drawing to the scale of 1:625,000, or between 9 and 10 miles to the inch. It embraces Danubian Bulgaria, the Balkan Range, and South-eastern Servia. It is bounded by the Danube on the north, and by a line connecting the towns of Nissa, Sofia, Kazanlik, and Misivri on the south; on the west it extends as far as Alexinatz and Negotin, and on the east as far as the Black Sea. Kanitz crossed the Balkans at no less than eleven different points, and, as his routes form a perfect network over the country, his new map is undoubtedly a most valuable contribution to the geography of Bulgaria.

New Russian Maps of Turkestan.—Among the chief Russian maps of Turkestan submitted this year to the Emperor for inspection should be mentioned one in thirty-eight sheets, on the scale of 1:84,000 (about $1\frac{1}{3}$ mile to an inch) of the Alai and northern Pamir, embodying the results of the recent military and geographical expedition thither: a map of the mountainous region between the provinces Syr-Daria and Ferghana, on the scale of 1:210,000; a general map showing all surveys executed in Turkestan during the year 1876, with plans of Khokand, Margilan, Osh, and other towns; a detailed survey from Bokhara to Charjui on the Amu, made by Captain Chernefsky, with the object of seeing whether it would be possible to irrigate the Khanate of Bokhara by means of canals drawn from the Amu instead of the Zerafshan. This proves to be impracticable, as the level of the Amu is lower than that of the land to be irrigated. M. de Khanikof, in communicating the above information to the Paris Geographical Society, remarks that we now possess accurate geographical information respecting the course of the Amu, from its delta in the Sea of Aral up to the confluence of the Kokcha.

AT a special meeting of the Geographical Society of Geneva, a national Swiss committee was formed, under the presidency of M. de Beaumont, in connection with the Central Committe at Brussels, for the purpose of forwarding the exploration of Central Africa.

ERRATUM.

In our last number the name "(USERE)" was inadvertently inserted on the map to the west of the Lake Nyassa. Usere is a port on the east coast of the Lake called Lisewa, by Young.

Proceedings of Geographical Societies.

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BRITISH ASSOCIATION.

SECTION E.

The Geographical Section (E) commenced its sittings at the Wesleyan Schools, Saltash Street, on Thursday the 16th of August, under the presidency of Admiral Sir ERASMUS OMMANNEY, C.B., F.R.S. The Vice-Presidents were Sir Samuel W. Baker, M.A., F.R.S., F.R.G.S., Major Wilson, F.R.S., Captain Verney, R.N., and Commander Cameron, R.N.; and the Secretaries, Mr. H. W. Bates, F.L.S., Assistant-Secretary R.G.S., Mr. Francis E. Fox, B.A., F.R.G.S., and Mr. E. C. Rye, F.Z.S., Librarian R.G.S.

THE PRESIDENT'S ADDRESS.

In his opening address the PRESIDENT remarked that it was his object to take a general review of the magnitude of geographical research, and the advance in geographical science which had been effected during the lapse of time since that great national Association previously assembled in that renowned town and great naval port of the West. He first, however, pointed to the change effected by the recognition of geography in the proceedings of the Association since the last meeting in Plymouth in 1841. Geography was then ranked only as a subordinate branch of one of the sections; it now formed a section of its own, and always commanded a considerable and increasing share of public interest, due, in a great degree, to the exciting and important revelations made by great discoverers, and the presence of many renowned travellers at the meetings. With a passing reference to the enlarged views now held by geographers in a more scientific direction, he proceeded to observe that geographical science had of late years received considerable impulse from the establishment of new societies on the Continent, and most especially from the inauguration of international congresses, destined to renew in a wide field of action all that had been so auspiciously established within the British Islands by our own Association. An excellent opportunity of comparing the position and methods of the past with those of the present day, in all that related to geographical investigation, was afforded by the Loan Exhibition of Scientific Instruments and Appliances, which was established at South Kensington last year. But, of all the inventions of interest to the navigator, was that produced by the genius of Dr. Siemens, "the bathometer," for measuring the depth of the sea without sounding lines. By means of this instrument, which can be placed in the cabin, the mariner can record, with the same ease as reading off the barometric pressure, the depth of the sea beneath him at a moment's glance.

In the year 1841 the triangulation of the British Islands was in progress: the great base line on Salisbury Plain, which was to be made the test of the accuracy of the work, remained to be surveyed: this base was laid down in 1849. The primary base line, on the margin of Lough Foyle, was 3 miles, and its length in the first instance was computed by a connected series of triangles projected on from Lough Foyle. When this base was measured by the standard compensation base, it was found that the actual measurement agreed within five inches of the length computed by the triangulation and trigonometry: this fairly expressed the accuracy which had now been introduced into this branch of surveying.

In the work of hydrographical progress we had ample reason to be proud of all that had been accomplished under the direction of those eminent hydrographers of the Admiralty—Beaufort, Richards, and Evans. During the same period our kindred across the Atlantic had taken up a very high position in this branch of knowledge. He deemed it opportune to accord a tribute of praise to the works of Captain Maury, of the United States, who had honoured them with his presence at the meetings of the Association, and with the benefit of his information. It was no less a duty to recognise the services of Admiral Sir Edward Belcher, who was a constant attendant at that section, and was a great contributor to the proceedings of the Association, and, as a marine surveyor, had left behind him a large amount of accurate work in all quarters of the globe.

At the very time that the British Association was holding its last meeting at Plymouth, Captain James C. Ross was engaged on his memorable expedition into the Antarctic Sea—a region replete with interest for discovery and scientific investigation. And to no better hands could it have been entrusted than to James Ross, who fixed the position, and planted the British flag on the north magnetic pole. The President reviewed in detail the work of Ross, who, on February 23rd, 1842, attained the latitude of 78·10 S., the highest southern latitude ever attained by man, and who approximately determined the position of the south magnetic pole. The knowledge of ocean physics and meteorology was also greatly advanced by that expedition. He next referred to Arctic exploration, reviewing the proceedings of all the expeditions which followed the unfortunate attempt of Franklin to force the North-West Passage, and especially those connected with the search for the luckless explorer. As an Arctic explorer he wished to express his unqualified approval at the conduct of Captain Nares in his wise decision to return home; nothing could have been gained by remaining out another season, and the able seamanship displayed in effecting the escape from such a perilous position was admirable, for it should be remembered that the three previous expeditions in this dangerous channel all ended in disaster and abandonment of vessels. Before quitting the glacial regions, he would venture to give his opinion with reference to future exploration. By the valuable information brought home by Nares as to the physical conditions of the palæocrystic ice, which he believed to occupy all the circumpolar area within the eighty-third parallel, all ideas of reaching the Pole from that direction, or anywhere north of the Parry Group, might be discarded; and he thought this formidable ice would arrest the voyager sooner or later in navigating towards the Pole. But, instead of nations racing for the Pole, let them accomplish what was practicable. To complete the coast line of North Greenland would be interesting to all geographers, namely, to connect the coast between Beaumont's farthest and Koldeway's north limit of discovery at Cape Bismarck, and might be accomplished from a winter station on the east coast. A scientific survey of Franz-Josef Land would be of great service to the interests of science. Payer observed a navigable sea from his extreme north position at Cape Fligeley between him and Oscar Land. Research in that direction appeared to hold out a hope of success in finding more land in that region. The Swedes were preparing an expedition to make a passage from Novaya Zemlya along the Siberian coast to Behring Straits. All must, however, admit that England retains the proud distinction of being the foremost nation in Polar research; and if Nares did not reach the Pole, his voyage had contributed largely to the sum of human knowledge.

Admiral Ommanney next briefly referred to the development of ocean telegraphy, the results of the 'Challenger' Expedition, and maritime meteorology. Directing attention to the Continent of Africa, he observed that Livingstone's last work of enduring toil was the discovery of the lakes Moero and Bangweolo, and following the watercourse of the Lualaba northward to Nyangwé. Upon his death the public feeling of this country to civilise the African, and to develope the pro-

ductions of the country, greatly increased. Under Stanley, Gordon, and Cameron the great achievement had been attained of navigating the three great lakes. To Colonel Gordon was due the honour of placing a steamboat on the Albert Nyanza, completing the work which the gallant Baker, the discoverer of the lake, had so much at heart. Last of all, a tribute of praise must be accorded to Lieutenant Cameron for his marvellous journey, as being the first European who had ever crossed tropical Africa from the Indian Ocean to the Atlantic, a distance of about 3000 miles, 1200 of which was over new ground never before trodden by white man. On this route he defined the water-parting between the basin of the Lualaba and the tributaries of the River Zambesi. Another naval officer, Mr. E. D. Young, had also earned distinction as a traveller by exploring the Lake Nyassa, which he found to extend 100 miles further north than Dr. Livingstone had imagined. The most interesting problem now to solve would be to find the head waters of the mighty Congo, and connect it with the Atlantic. Schweinfurth, south-west of Khartum, reached the water-parting of the Nile basin tributaries, and discovered the sources of a river trending into Central Africa, named the Uelle, Could it lead to the Shari, discharging into Lake Chad, or would it prove to be the Ogowé, which discharges into the Atlantic near the Gaboon River?

Sir Erasmus next called attention to the international effort initiated last autumn by his Majesty the King of the Belgians at a congress held in Brussels, attended by Sir Rutherford Alcock, Sir Henry Rawlinson, and others, for the purpose of organising means for the systematic and continuous exploration of Africa, and with a view to encourage the interests of all civilised nations in the world in furtherance of such a desirable object. One of the results of the Congress had been that the Council of the Royal Geographical Society had founded an African Exploration Fund, under the patronage of H.R.H. the Prince of Wales, with an Executive Committee. The Council had prepared a circular, showing the course they intended taking in this great movement, and mode of raising funds.

After briefly referring to explorations recently made in Asia and Madagascar, and to the great achievement of Lesseps, in the construction of the Suez Canal, Sir Erasmus next touched upon New Guinea, the late survey of the eastern end of which was another instance of countries lying contiguous to civilisation which had never been surveyed until recent date; it was scarcely creditable to a great maritime nation, that more was not known of the New Guinea coasts, within eighty miles of her own territories. Missionaries and expeditions of a commercial character from Australia had attempted to establish settlements, but without success.

The rapid progress and development of America since 1841, and the colonization of Vancouver's Island, the opening up of Japan, and Baron Richthofen's most instructive work on China were next referred to; and, in conclusion, the President recognised the marvellous service which the growth of steam navigation had rendered to geographical science.

Sir SAMUEL BAKER, in proposing a vote of thanks to Admiral Sir Erasmus Ommanney, adverted to the subject of African exploration. He remarked that in this work Englishmen had never failed in their part, except when the spirit was willing and the flesh was weak, and the travellers died on the way. England had peculiarly intimate relations with Africa, and, thanks to its colonial possessions and the influence it possessed with the Seyyid of Zanzibar, who, of all Oriental potentates, had shown the most honest desire to suppress the slave trade, it was better qualified than any other power to undertake the work of exploration. To conduct a number of expeditions at one time and from different centres, would involve enormous expense, and his advice was, that, in the future, the Society and the public should support one English exploring agency rather than a series conducted by various nations at one and the same time.

Sir JAMES ALEXANDER seconded the motion, which was unanimously adopted.

WESTERN SIBERIA.

Dr. LINDEMAN, Hon. Secretary to the Bremen Geographical Society, read an interesting paper narrating the work done by the Bremen expedition in Western Siberia, sent out in 1876, under the command of Dr. Otto Finsch, whose narrative the paper to a great extent embodied. The expedition was presented to the Czar at St. Petersburgh, and proceeded thence, during the early spring, to Tobolsk, which place they reached on April 9th. Proceeding thence, they crossed the river Irtisch, at Omsk, the ice on which was not broken. Thence they proceeded across the steppes, which, at some places, were covered with a crust of pure salt, until they touched on the Chinese frontier. An amusing account of maladroitness of the Celestial archers in their bow-and-arrow practice excited some laughter. Later in the season the expedition turned northward until they reached the mouth of the River Ob, and, embarking here, explored the shores of the inlet of the Arctic Ocean, into which it flows, displaying the German flag for the first time in these waters. Turning westward, over a tract of desolate, boggy country, they reached the Ural mountains, and attempted, during August, to penetrate to the seashore here, but failed, owing to the want of a boat and the impassable nature of the country. The reindeer disease was at this time inflicting terrible loss upon the herds of the country, and even some human beings, including their guide in the Urals, took the infection. With regard to a proposed canal to connect the Ob with the western system of navigation, the expedition formed the opinion that such a work would be impracticable, owing to the long winter, the tendency of the rivers to rise and fall like mountain streams, and the difficult character of the mountainous country which intervenes. Large portions of the journey were performed on sledges, drawn by reindeer. Early in September they returned to Obdorsk, and, later in the month, to Semarov, whence, during the autumn, they proceeded home. To the paper was added an interesting review of the specimens collected by the expedition, including important discoveries both in vegetable and animal life.

WESTERN AUSTRALIA.

Mr. H. W. BATES, Assistant Secretary R.G.S., read a paper by Mr. W. H. Tietkins on "The latest Exploring Expedition across Australia." This expedition, under Mr. E. Giles and Mr. Tietkins, traversed the district lying between the settlements of South and those of Western Australia, and described the country as consisting very considerably of barren, treeless, and waterless wastes. Camels were used in the expedition, and, but for these animals, it would have been impossible for them to have proceeded. On two occasions they were attacked by savages, but the superior arms of the whites soon satisfied their enemies of the fruitlessness of the struggle. The leader, however, had once a narrow escape of being tomahawked.

Mr. NICHOLLS, who had travelled from north to south of Australia, said the sterility of large portions of the country would prevent settlement, and the water was often so affected by saline deposits as to cause instant death to any one partaking of it. The introduction of the camel for purposes of exploration was an important feature.

Mr. TRELAWNEY SAUNDERS protested against the dismal prospect presented, pointing out that the trade of Plymouth, which was a great port for emigration to Australia, would suffer if the affirmative answer was returned to that challenge—that the interior of the country was incapable of providing a home for Europeans; and pointed to the testimony of Mr. Lands-

borough regarding the growth of forests in Australia, the consequent increased rainfall, and, as civilisation extended its influence interiorwards, the gradual reclamation of vast tracts of land previously considered barren.

Mr. NICHOLLS explained that Australia was a continent as large as Europe, that the inhospitable districts referred to were only a small fraction of its area, and that he was satisfied by far the greatest portion of its surface was rich and fertile. In answer to Sir SAMUEL BAKER, who described the properties and characteristics of the camel as the ship of the desert, Mr. Nicholls expressed his belief that the saltbush, which fattened sheep and cattle, would also offer sustenance for camels, and that if the bitter water of the lakes, which proved fatal to man and was avoided by the native animals, could be drunk with impunity by the camels, the deserts of Western Australia might be traversed just as safely and surely as the Great Sahara was crossed by the African merchants.

Friday, August 17th.

Vice-Admiral Sir ERASMUS OMMANNEY, K.C.B., in the chair.

EXPLORATION OF PALESTINE.

Major WILSON read a paper by Lieutenant Kitchener, R.E., entitled "Report of the Line of Levels from the Mediterranean to the Sea of Galilee." The levelling commenced in June 1875, but was soon interrupted by local circumstances. It was resumed in March 1877, and carried to a successful conclusion by Lieutenant Kitchener. There had, as yet, however, been no opportunity of applying corrections. The levels extended over 35¾ miles, and the result of the work showed the depression of the Sea of Galilee to be 682·544 feet below the Mediterranean. Fortunately, they had a perfectly calm day for securing the sea level. The sea left a clearly-defined white mark at its highest part: the depression shown by Kitchener's observations was some 40 or 50 feet greater than had been generally supposed. The depression of the Dead Sea was 1292 feet, and between the two seas there was a fall of a little over 600 feet; this fall was nearly even throughout, although there were one or two rapids in its course. The deepest part of the Jordan Valley would be 1300 feet below the level of the Mediterranean.

Mr. EDWARD JAMES asked if the lecturer had any theory to offer as to what became of the enormous quantity of water brought down to the Dead Sea by the Jordan.

Major WILSON replied that there was no doubt that the whole supply was carried off by means of evaporation, which, in that latitude, and in a country 1300 feet below the level of the Mediterranean, was something enormous. No doubt the Dead Sea at one period occupied a much larger area than it does at the present time, for salts and other contents of the water were found at a considerable distance up the Jordan Valley. As evaporation went on the Dead Sea gradually subsided, until at last the evaporation exactly compensated for the supply. If the Dead Sea were examined at different periods of the year a well-defined tide-mark would be found. Its highest periods were when the rains fell and the Lebanon snows melted, and its lowest towards the commencement of autumn. In regard to the survey of Palestine, he might further say that the War Office quite recently had granted the pay of two or three men to work steadily at the map, and he hoped by next summer the whole would be drawn. The map would then be issued as quickly as possible.

OVERLAND ROUTE TO INDIA.

Captain MARSH read a paper "On a Journey Overland to India *viâ* Mash-had, Herat, Kandahar, and the Bolan Pass, in 1872." The gallant traveller, who made the journey entirely at his own cost, crossed the Caspian in a steamer to Ashurada, which is the head-quarters of the Russian fleet on that sea. Thence he returned to Resht, on the southern shore, where he found significant signs of the terrible famine which had devastated that part of the country. After some delay, in consequence of fever and the difficulty of obtaining means of conveyance, he, accompanied by two other Englishmen, went on to Tiflis, where they procured mules for their journey to Teheran. He gave a glowing description of the ruins of Kasvin, the former chief town of Persia, compared with which Teheran itself was insignificant and disappointing. After hospitable entertainment at the latter city by the British Embassy, Captain Marsh proceeded eastward, but at Sabzawar he came to a dead halt, as the country was overrun with Turcomans. Eventually, however, he proceeded to Mash-had, the holy city of the Shi-ite sect of Muhammadans, which was literally a heap of bones, for burial within the sacred walls of the city was regarded as a desideratum by the whole sect. He found it necessary here to purchase native costume in order to continue his journey eastward, and, amongst other stores, he took Liebig's extract of meat, which was a great standby in places where no animal food was obtainable. After six marches he arrived at the Afghanistan frontier, marked by a simple mud fort, in which he found people packed like herrings, owing to the recent raids of the Turcomans. There was some difficulty in getting away, but after joining a company of merchants he proceeded. In crossing the river forming the frontier he had a providential escape from the Turcomans, who had encamped in the jungle. From Herat, the Governor and his whole army came out to welcome the traveller, and he could not have received a more cordial welcome had he been the Empress of India or the Governor-General. Herat was the key of both Persia and Afghanistan. It had often been besieged, but, although frequently captured and depopulated, it was still very thriving. The fortifications were almost impregnable, and a native army commanded by English officers could hold the place against the world. Its present force was 5000 men, but that could be supported by innumerable militia. The English were received here at present as friends, and had he been a Pasha he could not have been sent forward in greater state than that in which Yakoob Khan despatched him. He had endeavoured to impress the Governor with the importance of encouraging agriculture and trade, but he replied that it was necessary first to secure his own position. Captain Marsh then described his journey by way of Sabzawar and Farah to Kandahar, where, again, he had the most cordial reception. This was in December, and he proposed to go hence north to Cabul, notwithstanding the snow, which he learnt interrupted the route. But eventually the Governor told him that he could not be allowed to proceed as he had no permit, and that he was instructed to see him clear of the city on the northward road to Quettah. He had, therefore, to proceed thither, and was received by the Governor of that place, which was in Beluchistan, with due honours. Here he saw a most interesting picture of patriarchal life. The Bolan Pass, leading to Jakobabad in Hindustan, had then been closed for three months on account of the tribes being at war, but, thank God, he and his guide passed through in safety. The pass, he said, was 80 miles long, and could easily be defended. Major Harrison, the British agent to the Khan of Khelat, was encamped here, and a most interesting meeting took place. Thence to Jakobabad was plain sailing, and he reported himself there on January 5th, quite well.

Sir JAMES ALEXANDER proposed a vote of thanks to the gallant captain; and, in seconding the motion, Lord HOUGHTON remarked that the geographical information furnished by Captain Marsh was increased in importance by the political situation, which rendered every contribution as to the nature of the country he

had passed over, and its people, very acceptable. They must all acknowledge that they could not have a more valorous or enterprising pioneer than Captain Marsh.

BELUCHISTAN.

Mr. E. A. FLOYER (Indian Civil Service) read a paper on a "Journey in Beluchistan." This journey was made rapidly, but with care, in 1875-76, and the writer had also resided on the coast for some nine years. He gave a careful description of the southern portion of the country, its natives, and their manners and customs, together with a sketch of the history of the country and its chief products. This paper was the more valuable, as it furnished information respecting some portions of country never before trodden by a European, Mr. Floyer having taken a line between the routes of Captain Grant and Sir Henry Goldsmith. The lecturer enlivened his topic by some droll specimens of the folk-lore of the natives—for the most part a nomadic race, and possessing no written language. It had a strong affinity, he said, to the fables of Æsop.

SITE OF MOUNT SINAI.

Major-General Sir J. E. ALEXANDER, C.B., read a paper "On the Supposed True Site of Mount Sinai." In the spring of 1875 he was in the East in connection with his favourite project for the removal of the Alexandria obelisk, popularly known as Cleopatra's Needle, to this country, he having learnt that it was sought to be destroyed by a contractor for the sake of building materials. He visited the Holy Land and the desert of Sinai, and here fell in with Mr. Beavis, the painter, who, like Holman Hunt and others, sought to represent the people of the East in their true costumes and with natural accessories. Mr. Beavis had just finished a picture of what he held to be the true site of the delivery of the law, namely, Jebel or Ras Sufsafeh, in English "Willow Head." In front of this mountain there was ample accommodation for a greater encampment than that of the twelve tribes, whereas the site fixed on by Dean Stanley and others, Jebel Musa—the mountain of Moses—had no such plain in its vicinity. Cook's *Commentary* supported the views of the lecturer in favour of Jebel Sufsafeh, although the latter peak was inferior in height to that of Jebel Musa, the latter being 9,000 feet above sea level. The mountain had a bare and rugged summit; its flanks appeared upheaved by subterraneous fires, and its aspect was very majestic. The colour of the mountain was a reddish granite. At the conclusion of his paper Sir James again referred to the removal of the obelisk, which he hoped to see safely in England by the month of October, and especially praised the liberality of Mr. Erasmus Wilson, the well-known London surgeon, who had himself given 10,000*l*., the cost of its removal. McKillop Pasha had rendered him valuable service in dealing with the Egyptian authorities.

Mr. HARTSHORN, in reference to the identity of Mount Sinai, pointed out the valuable aid which might be obtained from local tradition, but it did not appear that Sir James had been able to gather any information on this point.

The CHAIRMAN said they must thank Sir James very heartily for the public spirit he had displayed in rescuing the obelisk of Alexandria from the hands of the spoliator.

THE BRAHMAPUTRA.

Colonel GODWIN-AUSTEN read a paper "On the Course of the Brahmaputra, or Sanpu." The author's argument, founded on researches and surveys in Assam, was that the true outlet of this great river was by the Sukushiri, and not, as was generally supposed, by the Deipong.

Mr. TRELAWNEY SAUNDERS ventured to differ by holding the conservative view of the subject, which, he suggested, would be a very proper one to bring under the notice of the Secretary for India. Here was one of the greatest rivers in the world, on our own frontier, still unknown to us, and it must remain so until a Government expedition or a private explorer met the question on the ground. The usual vote of thanks was accorded, and the section adjourned.

Monday, August 20th.

AFRICAN EXPLORATION.

Vice-Admiral Sir ERASMUS OMMANNEY, K.C.B., again presided.

Commander CAMERON read a paper on "Proposed Stations in Central Africa as bases for future exploration," by reviewing the remarkable journey of Dr. Livingstone on the Zambesi, and other travels which had opened up the country during the past twenty years. In this matter the old and new worlds might well shake hands, for Stanley's daring journeys were well worthy of those of old-world travellers. Much still remained to be done, and a step was taken last year by the King of the Belgians in starting an international association for the exploration of Central and South Africa, but eventually this great association broke up, and it was found better to form an entirely British organization which might work independently, but in friendly relation to other efforts. The committee had selected routes starting from the east coast as a basis of exploration. His opinion was that it would be better to establish a direct line of stations to explore certain districts, not only for the purpose of map-making, but for the extension of trade and commerce, and the general influences of civilisation. In appointing persons to the command of these stations it would be necessary to exercise great care, as they must be invested with magisterial power. At present the natives showed great inclination to gather for protection around any settlement formed by merchants or slave-traders, who granted them immunity from their warlike neighbours, in order to obtain necessary supplies. If, instead of the capricious rule of the slave-trader, the judicious rule of a British agent were established, they would soon find thousands of natives settling round, and as their numbers increased greater care would have to be exercised in dealing with them. It was doubtful whether our Government would give their authority to such a system as this, and, if they should decline to do so, the next best thing would be to place the agencies under the sanction of the Sultan of Zanzibar. In proportion to the work done, the excessive cost of travelling in Central Africa was more apparent than real, whilst the country possessed enormous natural wealth at present almost entirely undeveloped. The india-rubber trade was comparatively new. In the year 1875 the exports were worth 40,000*l*., in 1876 they rose to 100,000*l*., while this year they were estimated at nearly a quarter of a million. The rise in this important trade was entirely due to the enlightened efforts of his Highness Seyyid Burghash in suppressing the slave traffic in his dominions, the capital formerly used in the slave trade being now employed in this more legitimate commerce. Among the other resources of the country were Indian corn and various other grains, the export of which might form a most important food supply for the population of India. Considering the famines in that country, it behoved us to open up such an important resource—the products of Central Africa being vastly in excess of the native requirements. This would be a true solution of the over-population question. Apart from this great social question, it seemed that the continent of Africa had been purposely kept until this time in its present condition in order to supply the growing wants of the nineteenth and twentieth centuries. He believed the establishment of one or more great corporations, somewhat on the basis of the Honourable East India Company, although apparently the day for such great

enterprises was past—the spirit of the age was against the granting of exclusive powers to such bodies—would be the most efficacious means of bringing the centre of Africa under the influences of trade and civilisation. If from any cause the proposed stations could not be fixed, he would propose the opening up of a certain district, which, having been thoroughly explored, missionaries, traders, &c., would soon occupy, and thus form a basis for further exploration and settlement. All petty jealousies must, however, be put aside, or the prestige of the white man would be damaged. If the proposed stations were established they should be utilised as centres for meteorological and other scientific observations. The more rapidly the centre of Africa was opened up, the more rapidly would the disgraceful traffic in human flesh and blood be abolished. To the English this should be a work of especial importance. Devon and the West country were justly proud of the veterans and explorers of olden times, the Raleighs, Grenvilles, and others; but it could not be forgotten that there had been one who had sullied the British flag by introducing the slave trade, and that trade we, as Britains, were, therefore, indirectly responsible for. Thanks were due to the Khedive and the Sultan of Zanzibar, and also to Dr. Kirk, his most able adviser, for the efforts which had been made to put a stop to the traffic in the east of Africa, especially when it was remembered that the Sultan of Zanzibar was acting against a strong opposition on the part of members of his own family, and other persons of influence with him. The systematic exploration of Africa was a subject which now interested the whole world; little Belgium, readily responding to her ruler's call, had subscribed 12,000*l.* for sending out an expedition. Portugal had sent out an expedition at a cost of 20,000*l.*, and other countries were giving attention to the matter. If we did not take care we should have the fruits of our own efforts taken from us by more enterprising neighbours. In this country, where all the finances of the Government had to be submitted to the House of Commons, we could not expect the Government to act so liberally as those of other nations, but this should stimulate us as individuals to greater efforts to forward the scheme for the exploration of Africa.

Dr. BEDDOES had listened with the greatest satisfaction to the tribute of Commander Cameron to the enlightened policy of the Sultan of Zanzibar, under the able guidance of Dr. Kirk. He asked for further information as to suitable localities for the formation of stations or the districts in which the stations might be formed.

Sir JAMES WATSON, after a flattering reference to the gallant journey of Commander Cameron, and to the lucid explanation which he had given of his proceedings, said he considered the opening up of Central Africa the great problem of the age. Captain Young, of the Free Church Missionary Society, had gone up the Zambesi to the Victoria Falls, and afterwards proceeded to Lake Nyassa, and there the Free Church had formed a mission which would be useful as a starting-point for future explorers. These missionaries were anxious for the establishment of a route from Zanzibar to the north end of Lake Nyassa, which would throw open a most important district to trade and commerce. The Scotch Committee were only awaiting the formation of a London company for the development of Africa to afford it an auxiliary. There were good harbours on the coast near Zanzibar by which they might proceed to the interior without paying the heavy toll which the Portuguese levied on all goods sent up the country from the southward.

Mr. KERRY NICHOLLS thought there could be no doubt that, if the scheme advocated by the Exploration Committee were carried out, the work would be systematically and thoroughly done. An area of 800,000 statute square miles, or over six times the size of the United Kingdom, lay open for settlement. The central plateau had an elevation of over 4000 feet above the level of the sea, and it must be clear that the Geographical Society's scheme deserved universal support. He referred to the carrying of the land line of telegraph across the interior of Australia, and other daring exploits in the construction of routes over hitherto unexplored countries, and said that Khartoum, which has already telegraphic communication with Egypt, might be a base of operations whence a line of telegraph might be connected with the Zambesi, a distance of 2600 miles, only 600 longer than the line traversing the Australian continent. It was interesting to remember that they were now in the town which had formed the great Plymouth company for the settlement of Virginia, and that from the harbour in front of that town the Pilgrim Fathers sailed to found one of the greatest nations in the world. From the same Sound, too, Captain Cook started to prosecute those scientific explorations in the South Pacific which had resulted in the formation of our noble colonies in those regions. It was impossible to say that the work now proposed might not open to us a territory which would add to our prestige the glory of a second empire like that of British India.

Mr. TRELAWNEY SAUNDERS complained that in this matter, unlike their daring forefathers, the merchants of the present day were all asleep, and the missionaries were the only persons to follow up the work the geographers had commenced. The African trade of Rome and Carthage and Egypt had been extinguished by the Arab invasion, and all traces of ancient civilisation were swept away. This remained so until the explorers of this and other countries commenced their work; and already great results were achieved. It was clear, however, that somebody must be responsible for the conduct of traders and explorers, for we could not allow filibustering expeditions to shoot down the natives indiscriminately, as on a recent occasion was the case. He contended that only through the instrumentality of properly organised associations we could hope to bring the vast continent of Africa under the influence of trade and civilisation. But at present it would be useless to talk of telegraphs and other works.

Mr. NICHOLLS explained that he only referred to the telegraph as it was mentioned in the circular of the Geographical Society. If we were to go into Africa at all, it must be in a way in which we could benefit the natives, and great engineering works were necessary for the development of trade and commerce.

Professor TENNANT was anxious to say a few words with reference to recent diamond discoveries in South Africa. It might not be generally known that in this neighbourhood one of the finest collections of diamonds in England had been shut up for nearly fifty years. When he visited Plymouth with the British Association in 1841, he had great difficulty in finding this collection, which was one formed by Sir John St. Aubyn, and given to the Devonport institution. The police had the keys of the collection, and only allowed the public to inspect it on Saturdays. It was impossible to tell these diamonds from Cape diamonds, and he contended that the latter were, in respect of value, quite equal to other diamonds, although in some quarters they had been greatly disparaged. Within ten years, diamonds to the value of sixteen millions had been sent to this country; they were pure carbon, and of crystalline form. He mentioned the views of Dr. Atherstone, to whom the first specimens were submitted, he being a resident in the colony, and remarked that Dr. Atherstone was a strong advocate of telegraph communication through Africa. A large amount of gold had been found in the recently-annexed district of the Transvaal, and there was no reason why the country further north, to which their attention was now called, should not be equally productive of mineral wealth.

Mr. F. E. FOX, of Plymouth, pointed out the very important service which might be rendered if it were

possible to introduce on the main routes a cheap railway system, to throw open the country to trade and commerce. He would ask if any engineers present could suggest anything of this kind.

Mr. F. W. FOX, of Bristol, described a system of railway which could be constructed at one-half the ordinary cost, say 500 miles, for three-quarters of a million. Commander Cameron had estimated it at only half a million. It would be difficult, however, to find any one prepared to run it; but there need be no difficulty provided a nucleus were formed. He hoped the day would not be far distant when Commander Cameron would be appointed as British Consul to open up the trade of Africa.

Sir JAMES WATSON wished to know whether any serious opposition was likely to be offered by the petty native chiefs.

Sir JAMES ALEXANDER mentioned that in 1837 he was employed by the Royal Geographical Society and the Colonial Office to explore portions of Southern Africa. He found copper on the Orange River, and brought the first specimens of Cape copper to this country. He would be glad to know in what condition the mines at present were, as the companies had since declined to recognise him in any way as the discoverer of the metal.

Admiral NOLLOTH said, from his experience, he believed that the difficulty of copper mining in South Africa consisted in getting ships of sufficiently small draught to go up the rivers.

Mr. FRANCIS GALTON, as an explorer after Sir James Alexander, said it was quite correct that the whole country was full of copper ore, but the cost of transport was very considerable. In regard to routes, a wagon road had been made from Zanzibar to M'papwa, and here the dreaded tsetse fly did not exist, although it abounded in the country to the south, and would therefore prevent oxen and horses being driven there. The Geographical Committee proposed to work between the Zambesi and the Victoria Nyanza, and it was a difficult question to answer as to what these districts could furnish to the civilised world. Still, we ought to take stock of our estates in all parts of the world, and there could be no doubt that as the products of this district were brought out, new industries would arise for their utilisation.

Dr. LINDEMAN, of Bremen, assured the meeting that Germany took great interest in the English exploration of Africa. He mentioned the names of several German explorers who had worked on the Congo.

Commander CAMERON, replying upon the discussion, remarked that the extension of the telegraph into Africa was one of the great ideas of the age, but the wild African elephants, which roamed the country in herds, would be a great danger to the poles, which they would probably take to be a new kind of tree. In addition to subsidising the native tribes, we should have to subsidise the elephants. He considered a more feasible plan would be the laying of a cable from Aden down the East Coast of Africa, having stations at Zanzibar, Mozambique, and other points. In regard to the pioneer railway, the idea was that the whole traction power should be done by horizontal friction. No great cuttings or embankments would be necessary. The scheme was being considered by a Glasgow engineer. In regard to routes, he believed Lake Nyassa to be nearly in the same line as Lake Tanganyika. By establishing stations at the end of the lakes, and steamers upon them, they would have a most important water-way. To get into the Congo system it would be necessary to proceed to the Bangweolo, and turn to the northward to Nyangwe and Lake Sankorra, and thence down the unexplored portions of the Congo. Nyangwe was at present a native trading station, and would be important for a settlement. Another should be on Lake Sankorra. The capital of Muata Yanvo's country would be an important post, as also would be Katongo. Gold was found at Katongo in large quantities, but the natives preferred "the 'red copper' to the 'white copper.'" A route by the Dana River and the Victoria Nyanza would afford M'tesa an opportunity of holding his own against the attempted annexation of Egypt. In everything but length the Nile was a mere gutter to the Congo, at the mouth of which the depth was a thousand fathoms. The distance hence to Nyangwe was only 800 miles, and a fine service of steamers could be established. The stories of the murders in the Congo by Portuguese, and, he regretted to say, an Englishman too, which we had recently received, showed the importance of this district being taken charge of for the sake of civilisation.

The PRESIDENT congratulated the meeting on the discussion which had taken place, and regretted the absence from it of Sir Rutherford Alcock, who was at the head of the Exploration Committee. He believed the death of Livingstone had aroused an interest in Africa, and that we should now thoroughly explore it. He could not sit down without, as a naval officer, again expressing his pride at the gallant conduct of his brother officer (Commander Cameron), who, it must be remembered, had accomplished his great task without shedding a drop of blood. He proposed a vote of thanks to Commander Cameron for his valuable paper.

Sir JAMES WATSON, in seconding, expressed the hope that Plymouth would not be behind Glasgow in forwarding the great undertaking which they had in view.

EAST AFRICA.

Mr. H. W. BATES, one of the Secretaries, subsequently read a paper by Dr. J. Kirk, "On a Visit to the Mungao District, East Africa." The writer described the former desolation of the country by the slave trade. This traffic, however, had now been put a stop to, and as the coast possessed several splendid harbours, it might afford a good commencement of the route to the Nyassa. The only obstacle was the prevalence, in some of the best districts, of the tsetse fly. He would prefer M'linde, as free from this plague. An important trade in copal, of which large forests had been discovered here, had sprung up since the abolition of the slave trade.

Mr. E. C. RYE read the last paper, by Mr. F. Holmwood, "On the Kingani River, East Africa." In the exploration of this stream the writer had had a large share. The entrance to the Kingani was somewhat difficult. The banks were generally low, and the adjacent country was a vast plain. The upper reaches of the river were greatly impeded by long grass, sunken timber, and stones. The region continued damp and unhealthy, owing to want of natural drainage, for a long time after the rains had ceased. His belief was that as a navigable river the Kingani was practically useless. He would prefer the route by the Saadani road, although he looked on Mombasa as the future depôt of Central African trade. The mouth of the Wami could be readily improved, and would, he believed, be made fairly navigable for at least 40 miles. He would strongly recommend the route he referred to through Useguka being tried as the road to Unyanyembe and Ujiji.

Wednesday, August 21st.

Admiral Sir ERASMUS OMMANNEY in the chair.

The proceedings opened with a paper by Dr. J. S. PHENE, LL.D., describing a recent tour through unfrequented parts of Greece. Many of the places named he had visited at the risk of his life, and all of them at great pecuniary cost. He saw the temples of Bassa and Phygalea, points hardly ever visited even by fishermen. Here he found, amongst other notable objects, a prehistoric temple. He made a special effort to visit the northern islands on the coast of Thrace, and on one of the mountains—the difficult one of Samothrace—

found a magnificent cyclopean fortress, not mentioned by previous travellers in that region. The walls extended from the sea nearly half a mile up the mountain, and the style of the building was quite as rude as that of Tyros, and clearly later than Mycenæ. The island had a dangerous coast and hardly any anchorage, and it was, therefore, seldom visited.

Two other papers were read in this section by the secretaries, one contributed by Mr. ALFRED SIMSON, describing a journey from Guayaquil to the Napo, by the Upper Pastasa route, and another, by the same writer, giving the results of the journey up the River Putumayo, South America, which resulted in settling the question, the object of the journey, as to whether the river is navigable by steamers. Mr. Simson found it to be so. A discussion followed this paper, which concluded the programme of the section.

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PARIS GEOGRAPHICAL SOCIETY.

May 16th, 1877.—M. LEVASSEUR in the chair. Dr. J. TREVAUX reported that he had made an eleven days' journey on the River Kurn, in French Guiana, in a small war steamer, engaged in surveying duties. He furnished several botanical notes of interest. M. PAQUIER read a paper on Central Asia, a subject to which he has devoted special attention.

June 6th, 1877.—M. LEVASSEUR in the chair. M. DE LESSEPS introduced Major de Serpa Pinto and Captain Brito Capello, the officers of the Portuguese African Expedition. M. LUCIEN-NAPOLEON WYSE read a paper on the exploration of the Isthmus of Darien, with a view of constructing an oceanic canal through it. M. DELESSE gave an account of Dr. Hayden's explorations in the Western States of North America.

June 20th, 1877.—M. LEVASSEUR in the chair. M. LARGEAU writes from Wargla to say, that, owing to the disturbed state of the country to the south, he had determined to put off his departure for the interior of Africa till the 1st of October.

July 18th, 1877.—M. LEVASSEUR in the chair. M. C. WIENER wrote to say that he, with two companions, had made an ascent of the peak in the Bolivian Andes, S.E. of Illimani, and named it *Pic de Paris*. Its height, as determined by boiling point thermometer and aneroid, was 20,112 feet, its latitude 16° 33′ 10″ S., and longitude 70° 6′ 21″ West of Paris. Captain PERRIER sent a report to the Society on the operations for the determination of longitude between Paris, Neuchâtel, Lyons, and Geneva.

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PARIS SOCIETY OF COMMERCIAL GEOGRAPHY.

May 25th, 1877.—Messrs. JULES GARNIER and MEURAND presiding. The Committee appointed to report on the feasibility of an exhibition of African products in 1878, recommend that this project should be made to include all other countries as well, and that an application for a subvention should be made to the Government. General ROBIN read a paper on Chinese emigration, and M. H. CAPITAINE on the acclimatization of the *faham*, or *epidendrum ovatum*, an orchid well adapted for substitution for the tea plant.

July 18th, 1877.—M. HERTZ in the chair. M. CAPITAINE read a paper of M. l'Abbé Robert, on the employment of negro labour in Algeria, in which the Abbé expressed his belief that such an experiment could not be attended with success. The President insisted that civilised countries should do their best to reclaim the negro, while M. Capitaine was of opinion that a superior and an inferior race could never properly fuse and amalgamate, and that the eventual extinction of the latter was only a question of time.

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LYONS GEOGRAPHICAL SOCIETY.

April 19th, 1877.—M. LOUIS DESGRAND, President, in the chair. The election of the officers of the Society for the current year took place.

M. PAUL SOLEILLET read a paper on his journey to In-Salah, which was illustrated by a map of that part of the Sahara, compiled by M. Duveyrier.

In reply to a proposal of the Lyons Society, that, with a view to a better diffusion of geographical knowledge, all nations should agree to mark their postage stamps with the name of the state and province whence they are issued, the Geographical Society of Hamburg approves of the notion, but declines to take the responsibility of urging it on the Berlin authorities.

M. SCHWICH read a paper on recent discoveries of Italian travellers, touching upon those of D'Albertis and Beccari in New Guinea, and upon the Italian expedition to Shoa, in equatorial Africa, to join which Captain Martini had recently set out from Italy.

May 17th, 1877.—M. LARGEAU sent some interesting particulars respecting the formation of artificial oases in the Sahara by means of artesian wells, under the superintendence of Lieut. Lille, and on the process of the natural formation of dunes.

Dr. GAY read a paper on Brazil, which is to be published in the forthcoming number of the *Bulletin*.

July 19th, 1877.—M. LARGEAU sent particulars of an excursion he had made in the neighbourhood of Wargla, and of the ruins of a town called Chedrata, which was destroyed at the time of the Muhammadan invasion, and the ruins of which, like others in the Sahara, denote a high state of prosperity in former times.

Two committee meetings have already been held in connection with the approaching congress of Orientalists, to be held at Lyons in 1878, and preliminary arrangements have been made.

Colonel CHAMPANHET read a paper on Captain Roudaire's levelling operations in Tunis and Algiers, and, at the conclusion of it, expressed a doubt as to whether it was politic to undertake in Tunis an undertaking which would only benefit Algiers in part, while the proposed railway from Algiers to the Niger, and to Senegal, by way of Timbuctoo, would be constructed in a shorter time than the inland sea, and would prove much more profitable. This paper elicited a lively discussion, which was adjourned to the following meeting.

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RUSSIAN GEOGRAPHICAL SOCIETY.

Meeting of the 4th (16th) May, 1877.

M. SREZNEVSKY, the Secretary, read the usual monthly report. He detailed the preparations made for the expedition to the Angara and the water-parting of the Ob and Yenisei. Owing to the necessity of examining all existing information respecting the Angara, this part of the programme has been deferred till 1878, and the Committee have devoted themselves to the exclusive consideration of the scheme for uniting the systems of the Ob and Yenisei. All the projects which have ever been started towards this end, from the time of Colonel Ridder (1800) till the Expedition of Captain Sidensner in 1876, have been considered, and two routes have been selected as offering particular facilities—that by

way of the Keti, Lomovat, Yazef, and the Little and Great Kass; and the other, more to the south, by way of the Keti, Sochur, Pestchanka, and Chulesma. The first of these routes discovered by Funtussof in 1873, has already been examined in detail by Captain Sidensner's Expedition; the second is only vaguely known. The new expedition will this summer examine both routes and pronounce which promises best.

Mr. Smirnof, Professor at Kazan University, proposes to undertake a seventh and last journey through Russia this summer for the purpose of completing a series of magnetic observations extending over the whole of the Empire. He will ascend the Volga as far as Yaroslav, and thence journey to Arkhangel by way of Vologda; on his return he will journey by Onega and Kargopol to St. Petersburg. M. Raiefsky, who is bringing out a work on the production and trade of wheat, has arranged to go to Riga to make researches on the trade of that port in grain and textiles.

The first volume of the results of the Amu-Daria Expedition, containing meteorological observations made at Nukus and Petro-Alexandrovsk has been published.

Announcement was made that the National Committee for the Exploration of Africa had held its first meeting on the 19th of April, under the presidency of the Grand-Duke Constantine Nicolaivitch. Russia would be represented at the June Conference, in Brussels, by Messrs. P. de Semenof, Baron Osten Sacken, and Dr. Schweinfurth.

Dr. PIASSETSKY gave an account of the return of the recent Scientific and Commercial Expedition through China and Mongolia in 1875. He also exhibited a very large water-colour panorama, which he had painted day by day, depicting the country traversed.

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VIENNA GEOGRAPHICAL SOCIETY.

April 24th, 1877.—Dr. F. VON HOCHSTETTER, President, in the chair. The President drew attention to the value of the explorations made by Messrs. Forrest, of Perth (Australia), and Ernest Giles, of Melbourne, and announced that these gentlemen had been elected honorary members of the Society. Announcement was also made that His Imperial Majesty the Emperor, three of the Crown Princes, and the Minister of Education had all agreed to subscribe annually towards the funds of the Society, the subscriptions amounting in the aggregate to 1230 florins. The President made favourable mention of a map of the world compiled on the scale of 1:112,500,000 by Herr Broditzky, and showing, in a remarkably clear manner, the lines of steamboat traffic, and of marine and overland telegraphs, as completed up to the end of 1876. The length of the voyages between different ports is given, and the nationality of each steamboat company. Notice was made of two reports by Herr von Weigelsperg (i) on Technical Education in Belgium, illustrated by a statistical map showing the distribution of technical schools throughout the kingdom, and (ii) on the same class of educational establishments in Prussia, Saxony, Bavaria, and Wurtemburg.

Dr. F. SIMONY then read a paper on certain photographic views taken by him in the Austrian Alps.

May 22nd.—Vice-President V. HELFER in the chair. Hofrath von Becker read a paper on "Istria as a Field of Research and Development of Culture."

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ITALIAN GEOGRAPHICAL SOCIETY.

June 11th, 1877.—The usual monthly conference took place at midday, the President, Signor Correnti, conducting the meeting, which was attended by a numerous and select audience.

Prof. BELLUCCI was the first to speak. He was one of the members of the Commission sent by the Geographical Society to study the Gabes region, as to the greater or less possibility of introducing the waters of the Mediterranean into the Algerine and Tunisian Schotts. Prof. Bellucci explained the results obtained by Captain Roudaire, by the Italian Commissioners, by the Engineer, M. Fuchs, and Stake, the Geologist. He mentioned the original starting-points of the project presented in 1874 by Captain Roudaire; the studies completed by this gentleman in 1875 and 1876; and the results of the geometrical levels taken in the vicinity of the Schott *Mel Rir*, and across the district that runs from the so-called Isthmus of Gabes to the above-named Schott. He stated the great modification that the primitive project had to undergo in consequence of these researches, and how the possibility of its success was thereby rendered out of the question. The region occupied by the Algerine and Tunisian low-lying lands, even were the very vague suppositions of Roudaire with regard to the subterranean lake of the El-Gier-id Schott verified, would not be concentrated in one single basin, but in three distinct basins, separated by canals, of the respective length of 10 kilometres and 80 kilometres. The Professor then demonstrated the chief objections that have been and are yet raised against the said project—objections founded on the observations that the Italian Commission had the opportunity of making in the Gabes region, and on those instituted in the same spot by Fuchs, Stake, and others. He concluded by remarking that, both from the report presented by Captain Roudaire, and from the representations made respecting this report, by a Committee of the French Academy of Science, the necessity of further and deeper investigations became obvious, chiefly with regard to the new direction given to the primitive project of Captain Roudaire.

Signor BRUNIALTI next spoke on the subject of the economical reasons that were in opposition to this plan, fully recognising, nevertheless, the necessity that existed for some new means of approaching Central Africa. This led him to mention two projected railways, one of which the French were desirous of constructing between one of the Algerian ports and Timbuctoo, and another which M. Rohlfs, following up, possibly unconsciously, the ideas of our fellow-countryman, Signor Paladini, wished to make between Tripoli and Kuka on the Sciad Lake. Signor Brunialti described the two different lines proposed and their mutual advantages, namely, the placing in immediate connection with Europe the wealthy regions of Central Africa.

He entered upon the objections raised with regard to the ferocious inhabitants, to the scarcity of water, and the want of wood and coal. Comparing the two plans of railway, he showed that that of M. Rohlfs was by far the more eligible for our commercial interests, and said that it was his hope that Italy would join Germany in making the preliminary studies on this line, which would open up Central Africa to civilisation, commerce, and geographical science.

Signor GUARNASCHELLO PAGANO then spoke at considerable length on the subject of the geological and orohydrographic conditions of Sicily.

NOTICE.

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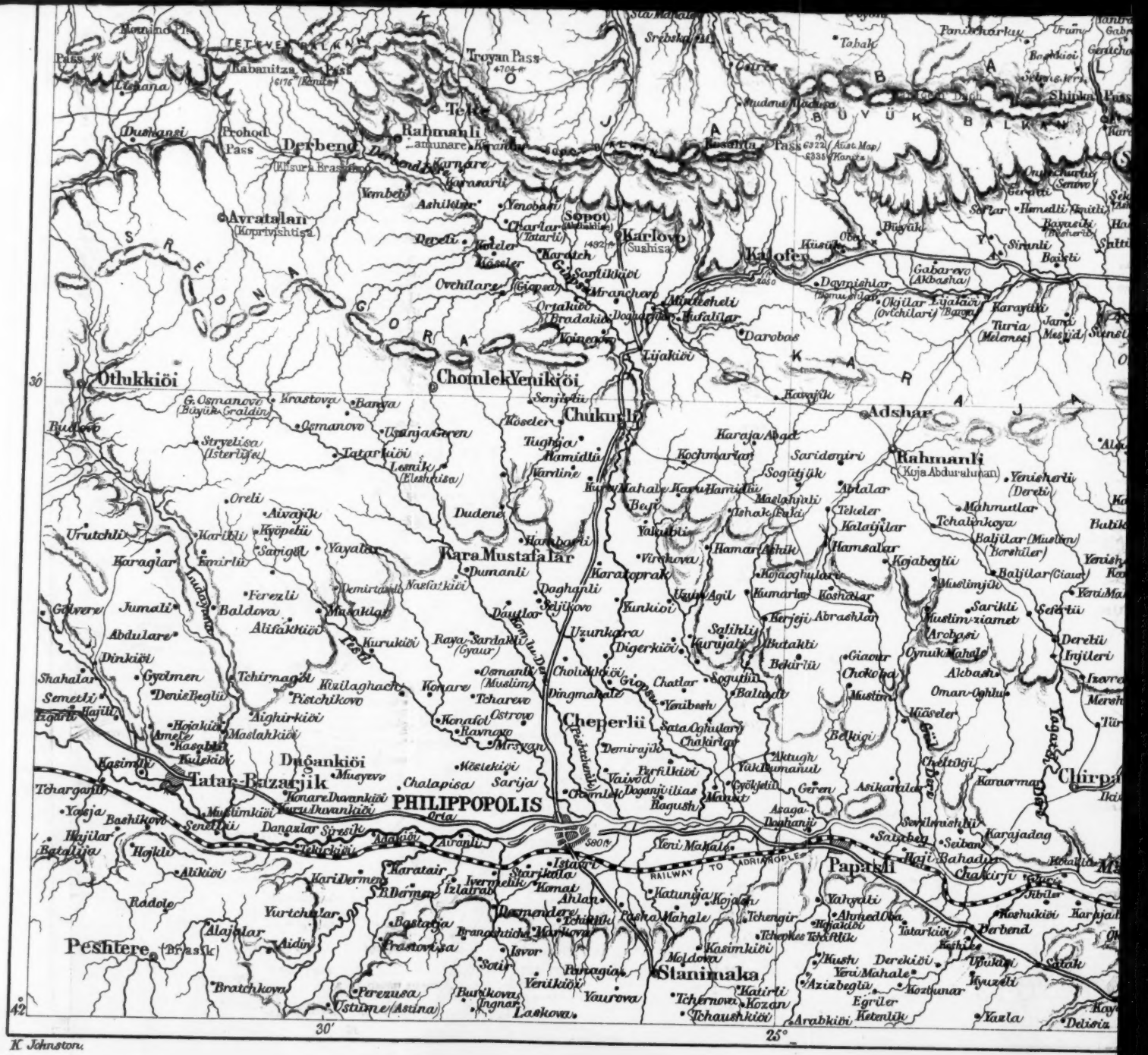
Perdilovo
Begiys
Katunes
Beranovo
Muselim-Mahalata
Liseri
Pridunshez
Ugurtchani (Ugarchin)
Kolinik
Pordim
Lovcha (Lovez) (Lovatz)
Radevitzan (Radeševi)
Metodova
Goznisa
Krastovo
Shait-kanei (Shahunkaya)
Mirkovo
Sredna Mahala
Selim
Gulez
Tatarli
Leven
Bulgareni
D. G.
Bivol
Ablanisa
Taranli
Aladen
Lomez (Lomdscha)
Borima
Suha
Dobrodan
Vratcha
Vrabez
Dimyanove
Rabiva
Babastan
Debnovo
Hirna
Chadirli
Vidima
Berëva (Beriev)
Granisa (Gradnitsa)
Dushava
Derelü
Mlatchevo
Troyan
Kalevice (Kalaisa)
Bülishdüler (Bdin)
Branyvec
Tershiska mahala
Balabanitza mahala
Granitchar mahala
Sipkovo
Orsehak
Monastir
Kandel
Savarna
Vlast
Troyan
Tabak
Sla Mahala
Nerosela
Srbiska Mt.
Cairea
Troyan Pass 4705 ft
Tetreven Balkan
Tekke
Rahmanli
Kamunare
Kerandel
Kasaklia Pass 6372 (Asst. Map) 6336 (Kanitz)
Avratalan (Koprivshtitsa)
Karlovo (Sushisa)
1492 ft
Kalofer
Gabarevo (Akbasha)
Dayrishlar
Okjilar
Lijakiöi (Ovchilari)
Darobas
Buyuk
Kusüle
Obor
Sredna Gora
Balkan
Kara
Kamunica (Krsamunica)
Tchalyserat
Susurluk (Bivolar)
Opanesh (Pusiyu)
Bukova (Bukovtsi)
Verbitsa
Etropol
Mahaleta
Abaskiöi
Tirstenik
Demirkai
Staroselzi
Shingane Serai
Shirsha
Starovierzi
G. Rahovitza
Krushevo
Lekar
Bragal
Slavoviza
Gigen
Gigen Mahala
Vadin
Besti
Korabia
Selci
Orlia
Gurapadina
Grosdipol
Patelu
Motaru
Magura (Tepe-ka)
Ghirkovu
Rakovitsa
Tirstenik
Bryslan (Brichnen)
Meshka
Ashagi Meshka
Mahala
Svigaliya
Tchalyserat
Kopriva
Martevisa
Liben
Zlokuchka
Vid
Kreta
Komarevo (Komarova)
Kanli II
Debovi
Ashagi
Tirstenik
Karadatch
Karaatch bujaru
Vina
Vorvish selo
Tratchenisa
Sirkalovisa
Koyulovse
Tcherkeskoselo
Novadsha
Tatarsdo
Lesii a (Ligen)
Kenadin
Novoselo
Pet Kladenci
Kozlovo Mahala
Istij
Darobas
Lijakiöi
Karajik
Adshar
Rahman
Ahlalar
Maslahjali
Tchakir Baki
Teheler
Kalaijilar
Hamsalar
Kojabeglü
Kumarlar
Koshalar
Berjeji
Abrashlar
Muslin
Arobe
Oynuk Ma
Chokolba
Omar
Muslim
Köseler
Balaigi
Kochmarlar
Saridemiri
Sogütjük
Kara Hamidlü
Kara Agach
Kara Mustafalar
Karatoprak
Virchova
Hamar Aslik
Hojaoghulare
Kumanli
Naslatkiöi
Daghanli
Kinkiöi
Uzunkara
Digerkiöi
Satihli
Karujali
Bekarlü
Chatlar
Yenibesh
Balusdi
Sogutlü
Cheperlii
Sata Oghudari
Chakirlar
Ostrovo
Ramnovo
Mrovan

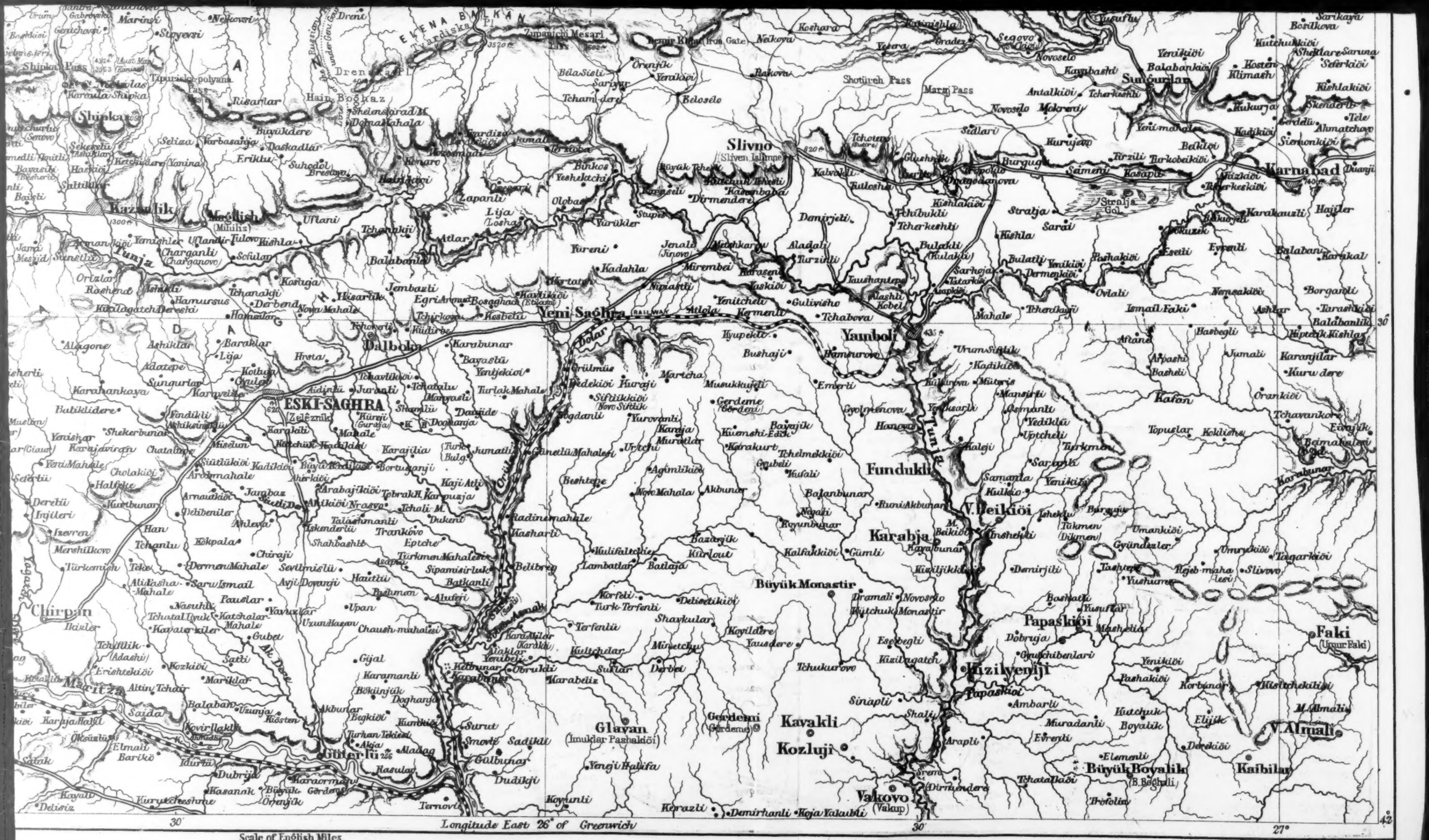
A MAP OF THE SEAT OF WAR IN EUROPEAN TURKEY.

Chiefly from the Austrian Map.

30°
26°
Alexandria
GIURGEVO
RUSTCHUK
Simnitza
Sistova
Biela
Tirnova
Kiliflar
Drenova
Elena
Gabrova
Travna
Shipka
Kazanlik
Eski-Saghra
Yeni-Saghra
Popkioi
Yaslar
Slivno
DANUBE
Lom
Vid
Osm
Yantra
Jantra
Tundja
Maritza
Batolia
Zapanichi Mesari
Demir Kapu (Iron Gate)
Trudiska P.
Hain Boghaz
Shelenograd M.
Dolna Mahala
Tchamdere
Belosélo
Sarlyar
Bélasisli
Yenikioi
Rakova
Nekova
Kirlitchlar
Arablar
Masirgikioi
Kojabunar
Armudli
Borila
Sushisa
Dragonovo
Kalbunar
Kadikioi
Karatchoma
Durenjik
Konakkioi
Kurudere
Balabanlar
Demirlar
Ishiklar
Kajirga
Tchamija
Jumalikioi
Kolyikioi
Koslar
Karaisch
Huseinn
Osm
Koslubea
Hamidkioi
Turkes
Keshkatchi
Koseki
Hasar
Bashi M.
Miranlik
Yovanlar
Hadirkioi
Balaslar
Turby
Kavarlar
Batramkioi
Savlar
Catalja
Dobridja
Tirlikioi
Tonturi
Karagatch
Karuvelikioi
Sofuzurda
Balkoshalar
Tchirkoler
Karalar
Velikioi
Tshpatlik
Derekioi
Ainadja
Begli Mahalesi
Beshevsi
Dragichevo
Slatarisa
Julduk
Kadi Siftlik
Prisovo
Mati Siftlik
Dibelé
Sered (Arnautkioi)
Merdan
Tirnova
Tirnovo
Arbanasi
Leskovisa
Rahovisa
Kosharovisa
Tatarevo
Jumalikioi
Tchemeje
Demirlar
Balabanlar
Ishiklar
Kajirga
Kara Tokat
Ogarshtin
Abtava
Kara Tokat Dere
Kropchi (Kulovtcha)
Orenjik
Sinankioi
Bekirin
Yeni-kioi
Opaka
Kostanza
Ortshinova
Kavalyevo
Batinsa
Buzovsa
Osmisa
Kara Verbenka
Stroko
Beldigne
Tchernisa
Tchernevi
Tabashka
Pepelene
Solenik
Solzmik
Nisova
Eshirje
Sidina
Fisansa
Kirimno
Vetova
Lom
Buzin
Kadikioi
Bushima
Yovan Siftlik
Kara Kojali
Kosova
Metchka
Krasna
Ingus
Basarbova
Soujdé
Yenishekioi
Bealan
Semerdshikioi
Odentik (Ovadentik)
Otanza
Yeni Esmil (Novosélo)
Lipnik
Sharvenavda
Tatova
Karvan
Purasarli (Trosena)
Da Ablanova
Garoula
Sarnebi
Maryan
Tabak
Para Mahale
Kayali Mahale
Slepova
Islepol
Rahova
Babova
Karasu
Stanesti
Gidaru
Nazirli
Otnakul
Branishte
Fratesti
Turbat
Odaya Oncesti
Odaya Ivenaro
Bulanovaia
Putineiu
Hodivoia
Nieru
Kakalatshi
Gogosari
Slobozia
Malu Deyos
Balta Mairu
Kuli
Tchamadan
Dolni
Parapon
Bellerie
Gauyani
Petrisu
Petrosani
Bosap
Tsintsereni
Frumos
Konsesti
Brigadir
Odaia
Soimu
Gaurisau
Smerdeas
Servéni
Beliu
Brentzeni
Furkulesti
Spatarei
Kalomfiresti
Tsiganesti
Nemernitz
Putzintei
Murtzinesti
Poroskia
Parani
Pielea
Trestenikul popeshti
Trestenikul desus
Rosmiresti
Gavaneshti
Grosul
Alexandria
Suhoia
Finaineli
Skaeshti
Veraska
Ostrovo Persina
Gurabeli
Oreshen
Carevisa (Tékir)
Vinograd
Beshene
Budshar
Buzurluk
Klodenisa
Istijar
Haji Musa
Ortchamoglia (Koymzu)
Akktchair
Sirshali
Vrzil
Yaidshi
Slamir
Karana
Batak
Osmar Gradishte (Gradesnitsa)
Butova
Ivanovsa (Ovansa)
Teritcho
D. Lipnisa
C. Lipnisa
Mekish
Osinovsa
Radan
Sahra Trembesh
Karantcha (Karinja)
Erdjanli
Sahra Kosova
Kosna
Karamsal
Kopriova
Osikova
Sartakjoi
Gagovo
Tchamarzi
Höjekioi
Tchavlikioi
Tchanakju
Hisartik
Egri Armut
Bosgadjak (Bekiari)
Kavlikioi
Kesbetli
Tchorlu
Kudurbe
Karabunar
Bayastü
Yenijekioi
Dalbokoi
Ashiklar
Barakiar
Lija
Koilun
Gaulan
Aidinlü
Juranli
Tchatalu
Turlak Mahale
Manyasli
Shamlü
Dautide
Kürüs
Mahale
Doghanja
Karajilia
Turk Bulg.
Jumatli
Güneshli Mahalesi
Ortchi
Yurovanli
Kamija
Muratlar
Karakurt
Siftlikkioi
Novo Siftlik
Bogdanli
Gerdeme (Gordeni)
Kuemshi-Esk.
Musukkuyoji
Maritcha
Karaagatch
Balsi Yumarkioi
Pisapina (Kosabina)
Karadash
Kopace
Vodisa
Orülmüs
Bedekioi
Kuraji
Tchorkoya
Tchatakalu

GIURGEVO
RUSTCHUK
Biela
Popkioi
Yaslar
Rasgrad
Sersova
Kumalar
Sayut
Kotel
Osmanbazar
Slivno
Yeni Saghra
Yambol
Eski Juma
SHUMLA
Verbisa
Elena
Tirnovo
Sofia
Eski-stambul
Varnabad
Sumfurlar
Fundukli
V. Beikioi
Karabja
Büyük Monastir
Yaila Balkan
Dragoi Balkan
Karnabad Balkan
Elena Balkan
Hadiska Pl.
Kazan Pass 1925
Shotüreh Pass
Maraj Pass
Danube
Lom
Vit
Iskar
Maritza
Tunja
Arda
Kara Lom
Kara Su
Kara Dere
Kamchik
Deli Yusuflar
Kara Dere
Kara Su
Kara Dere
Kara Su
Kara Dere
Kara Su


Rabanitza Pass
Troyan Pass
Rahmanli
Derbend
Prohod Pass
Dushanzi
Avratalan
Sopot
Karlovo
Kalofer
Shipka Pass
Hainkioi
Chomlek Yenikioi
Otlukkioi
Chukurli
Adshar
Rahmanli
Kara Mustafalar
Cheperlii
Tatar-Bazarjik
PHILIPPOPOLIS
Stanimaka
Papatsli
Peshtere
Duganlkioi
Chirpan
Sredna Gora
Karaja Abad
Kochmarlar
Saridemiri
Sogutjuk
Yenisherli
Mahmutlar
Tchalenkoya
Baljilar (Muslim)
Baljilar (Giaur)
Kojabeglii
Hamsalar
Tekeler
Kalajilar
Ablalar
Maslahjuli
Tchak Bala
Hamar Ahlik
Virshova
Yakubli
Karatoprak
Kojaoghulare
Kumarlar
Koshalar
Herjeji
Abrashlar
Muslimjuk
Sarikli
Muslim-ziamet
Arabasi
Cynuk Mahale
Derebii
Injileri
Akbashi
Oman-Oghlu
Mustan
Giaour Chokoha
Bekirlii
Sogutlu
Balaban
Chatlar
Giopsa
Dingmahale
Yenibesh
Sata Oghulari
Chakirlar
Belkioi
Aktugh
Yakumanuli
Cyoklju
Geren
Asikarula
Karaormanli
Chiftlijgi
Asaga-Daghanji
Seibanli
Karajadag
Haji Bahadur
Chakirju
Yahyali
Ahmedoba
Tatarkioi
Verbend
Koshukioi
Karajah
Jibilar
Upukli
Kyuzeli
Saitak
Moldova
Kasimkioi
Tchengir
Tchepkes
Tchiftlik
Hojakioi
Kush Derekioi
Yeni Mahale
Azizbeglii
Egriler
Kozan
Tchernova
Kaitirli
Mozhunar
Arabkioi
Ketenlik
Yazla
Delisira
Yaurova
Laskova
Ustume (Astina)
Perezusa
Venikioi
Panagia
Isvor
Sotir
Brastovitsa
Bastatja
Yurtchalar
Aidin
Alajalar
Radole
Alikioi
Karidermen
Karatair
Izvorchik
Izlatrab
Ahlan
Katunija
Kojadin
Pasha Mahale
Tchiflik
Hamandar
Ishkodra
Stanjakioi
Iskar
Yeni Mahale
Ortakioi (Bradakia)
Orchilare (Ciapsa)
Mranchevo
Mindisheli
Hafalilar
Darobas
Lijakioi
Voinegovo
Daymishlar
Gabarevo (Akbasha)
Okjilar (Orchilari)
Liyalari
Karayilik
Turia (Melanes)
Jami Mesjid
Siranli
Baibli
Buyuk
Obe
Kuzuk
Sofular
Hamedli
Bayandi
Yenisherli (Dereli)
Mahmutlar
Tchalenkoya
Baljilar (Muslim)
Baljilar (Giaur)
Yenishe
Muslimjuk
Derebii
Injileri
Akbashi
Oman-Oghlu


ESKI-SAGHRA
Veni-Saghra
Yamboli
Fundukli
V. Beikioi
Karabja
Papaskioi
Kizilyenji
Faki
Karnabad
Slivno
Sliven
Shipka Pass
Shipka
Kazanlik
Maglish
Lunja
Dalbokn
Chirpan
Maritza
Güterlu
Glavan
Kavakli
Kozluji
Vakovo
Büyük Monastir
Büyük Boyalik
Kaibilar
V. Almali
Longitude East 26° of Greenwich
Scale of English Miles.
10
20
30
40
50
T. Pettitt & Co. Litho, London.